5th International Conference

Youth in Conservation of Cultural Heritage

21st-23rd September 2016 - Madrid -

www.yococu2016.com

2016 YOCOCU youth in conservation of cultural heritage madrid

Book of abstracts

ORGANIZED BY:

IGEO INSTITUTO DE GEOCIENCIAS

CSIC

UNIVERSIDAD COMPLUTENSE MADRID

YOCOCU YOuth in COnservation of CUltural Heritage

MUSEO NACIONAL CENTRO DE ARTE REINA SOFIA

FUNDACIÓN MUSEO REINA SOFIA

Coordinated by:
Instituto de Geociencias IGEO (CSIC, UCM)

Co-organized by:
Youth in Conservation of Cultural Heritage - YOCOCU España
Museo Centro de Arte Reina Sofía MNCARS
Fundación Reina Sofía

Edited by:
Mónica Álvarez de Buergo
Beatriz Cámara Gallego
Duygu Ergenc
Sofía Melero Tur
Elena Mercedes Pérez-Monserrat

First edition Madrid

ISBN: 978-84-617-4237-0

SCIENTIFIC COMMITTEE

Fernanda PRESTILEO Istituto per la Conservazione e la Valorizzazione dei Beni Culturali - CNR, Italy
Richard PRIKRYL Charles University in Prague, Czech Republic
Javier REYES TRUJEQUE Universidad de Campeche, Mexico
Lilia RIVERO Curator of Palacio Nacional, Mexico
María Isabel RODRÍGUEZ-MARIBONA TECNALIA, Spain
Silvestro RUFFOLO Calabria University, Italy
Cesáreo SAIZ JIMENEZ CSIC Spanish Research Council, Spain
Margarita SAN ANDRÉS Complutense University of Madrid, Spain
Juan Antonio SÁNCHEZ Museo Nacional Centro de Arte Reina Sofía, Spain
Maria STEFANIDOU Aristotle University of Thessaloniki, Greece
Magdalini THEODORIDOU University of Cyprus
Akos TÖRÖK Technical University of Budapest, Hungary
Julio VALENCIA NAVARRO Universidad Nacional Autónoma de México UNAM consultant, Mexico
Patricia VAZQUEZ Reims University, France
Ruthy WERTWAGEN Haifa University, Haifa, Israel
Karima ZOGHLAMI Université de Carthage, Tunisia

ORGANIZING COMMITTEE

Mónica ÁLVAREZ DE BUERGO Instituto de Geociencias IGEO (CSIC, UCM), YOCOCU Spain **Chair**
Natalia PÉREZ-EMA Instituto de Geociencias IGEO (CSIC-UCM), YOCOCU Spain **Co-Chair**
Jorge GARCÍA GÓMEZ-TEJEDOR Museo Nacional Centro de Arte Reina Sofía MNCARS, Spain **Co-Chair**
Norma BARBACCI World Monuments Fund WMF **Co-Chair**

Beatriz CÁMARA Instituto de Geociencias IGEO (CSIC, UCM), Spain
Duygu ERGENÇ Instituto de Geociencias IGEO (CSIC, UCM), Spain
Rafael FORT Instituto de Geociencias IGEO (CSIC, UCM), Spain
David Martín FREIRE-LISTA Instituto de Geociencias IGEO (CSIC, UCM), Spain
Miguel GÓMEZ-HERAS Instituto de Geociencias IGEO (CSIC, UCM), YOCOCU Spain
Laura HERNÁNDEZ Museo Nacional Centro de Arte Reina Sofía, Spain
Pablo LONGORIA World Monuments Fund WMF
Laura LÓPEZ Universidad Politécnica de Madrid UPM, Spain
Andrea MACCHIA YOCOCU Italy
Inma MARTÍNEZ GARRIDO Instituto de Geociencias IGEO (CSIC, UCM), YOCOCU Spain
Sofía MELERO Universidad Politécnica de Madrid UPM, Spain
Alejandro MORENO Museo Nacional Centro de Arte Reina Sofía, Spain
María MUÑOZ Filmoteca Española, Spain
Mayte ORTEGA Museo Nacional Centro de Arte Reina Sofía, Spain
Ana PALACIO Museo Nacional del Prado, YOCOCU Spain
Elena Mercedes PÉREZ-MONSERRAT Instituto de Geociencias IGEO (CSIC, UCM), Spain
Marta RAMÍREZ Fundación JUAN MARCH, YOCOCU Spain
Pilar RUBIALES YOCOCU Spain
Silvia SALTOS ROSERO Instituto de Geociencias IGEO (CSIC, UCM), Spain
Aránzazu SIERRA Instituto de Geociencias IGEO (CSIC-UCM) - Universidad Carlos III, Spain
María José VARAS MURIEL Universidad Complutense de Madrid UCM, Spain
Carmen VÁZQUEZ-CALVO Instituto de Geociencias IGEO (CSIC, UCM), Spain
Cristian ZAPATERO MARTÍN Instituto de Geociencias IGEO (CSIC, UCM), Spain

AZERBAIJANI MILLIONAIRE HAJI ZEYNALABDIN TAGHIYEV'S ATTITUDE TOWARDS CULTURAL HERITAGE

Abbasova, E.[1*]; Jafarli, T.[1]; Hassanova, N.[2]

[1]Miras Public Union for the Study of Cultural Heritage, Baku, Azerbaijan,
[2]Secondary school #55, Baku, Azerbaijan

In every nation's history there are unforgettable people who leave traces behind them and stay in minds with their innovative thoughts and charitable activities. One of these personalities is Haji Zeynalabdin Taghiyev recognized as the father of the nation. Born into a poor family, this wise man could not even conclude his primary education, yet became rich by coincidence. His life goal was serving to his nation throughout all his life. In his memories, Taghiyev wrote: "the most important thing for me is decency and education of my nation". All his entrepreneurship, charity and enlightment activities were directed to cultural heritage and legacy, polished with real bright mind. Taghiyev was a man of very elegant taste. The premises built with his order and other buildings serving to a number of official objectives obviously prove it. The first Muslim charity society established in Baku in 1905, the schools built by his orders, the first girl school reflect the nation in the face of Taghiyev and strengthen the nation's attitude towards cultural heritage.

Taghiyev invited experts from different cities of the World and Europe to Baku. He achieved establishing the first theatre building in Azerbaijan. According to historical facts, Haji used to go theatre every evening and watched performances in his special seat. Having affection towards cultural heritage, Haji funded the education of many children from poor families and paid them to study abroad. The amazing building known as Azerbaijan History Museum, which is the special beauty of our capital city nowadays is also famous for being established by Taghiyev. Unique with its original architecture, this architectural pearl shows Tagiyev's attitude towards cultural heritage. Both Oriental and European halls of the building, even the whole project are the examples of Azerbaijani Millionaire's deeds for his people, his nation. The subject will be widely explained in the article.

* Corresponding author: E. Abbasova abbaselmira@mail.ru

LOSS COMPENSATION OF MARBLE, LABORATORY EXPERIMENTS AND PRACTICAL CONSIDERATIONS

Agárdi, F.[1*]; Káldi R.[1]; Szemerey-Kiss, B.[1,2]; Török, Á.[2]

[1] Hungarian Univesity of Fine Arts, Budapest, Hungary, [2] Budapest University of Technology and Economy, Department of Engineering Geology and Geotechnics, Budapest, Hungary

Loss compensation of natural stone, especially marble requires special attention in terms of material selection, compatibility and aesthetic issues. The paper is focusing on various materials that can be used for loss compensation of marble and polished dense limestone. In addition, it brings a practical example how these materials can be used in the loss compensation of a Carrara marble statue.

Laboratory experiments included the preparation of tests specimens of 9 different potential composites. The tested binders included epoxy-resin based compounds, acrylate resins, gypsum and white cement. Grinded marble, quartz sand and glass spheres were used as aggregates in the prepared 46 specimens. Properties of samples with various binder/aggregate ratios were compared by visual assessment, polarizing- and stereo-microscopy and by using scratching hardness. The epoxy resin based material had the best and most compatible values to marble. The binder aggregate ratio was 8:92. As an aggregate both grinded marble and glass spherules were added. Providing the best values this material was selected for the loss compensation of the Carrara marble statue.

These results have demonstrated that the loss compensation is almost impossible with mineral binders. The commonly used binder materials such as resins and organic binders have been proved to be better, however large number of laboratory test are required to select the appropriate material for loss compensation and the long term behaviour of material also needs to be studied in details.

*Corresponding author: F.Agárdi agardi.fanni@gmail.com

DIAGNOSIS STUDIES OF WATERLOGGED COMBS FROM THE SARIKAYA ROMAN BATH EXCAVATION IN TURKEY

Akpınar, Y.*

Directorate of Central and Regional Laboratory for Restoration and Conservation, Istanbul,Turkey

Sarıkaya Roman Bath Salvage Excavation is located in the thermal springs area, which is still actively used, in the town of Sarıkaya in Yozgat. The Directorate of Yozgat Museum initiated a cleaning project and salvage excavation in the area in 2011, revealing a bathhouse with architectural elements and archaeological objects around it, which reflect a rich cultural heritage dating back to the 2nd Century AD. Remains of the Roman Bath and its build-ons were used until the 1970s. 104 waterlogged wooden combs and comb fragments were obtained in the area referred to as the 5th Site of the excavation area.

The artifacts were preserved in humidity in the excavation site, and, according to the waterlogged wood conservation process, were wet as they were delivered to the Restoration and Conservation Center and Regional Laboratory of Istanbul, where active conservation projects were to be conducted. The artifacts were photographed in detail upon their arrival to document their condition and taken to appropriate storage boxes. A preliminary cleaning was performed on the artifacts using mechanical techniques, and, later, an ultrasonic cleaning device was used for more sensitive and meticulous cleaning. Samples of the soil between comb teeth recovered during the cleaning were analyzed by Raman Spectroscopy and XRF.

Tap water the waterlogged wooden combs were preserved in was replaced routinely every month, during which water conductivity and pH values were analyzed.

Following the cleaning process, the artifacts are documented with photographs and hand drawings. Technical attributes of the artifacts as well as deteriorations were marked on the hand drawings. As the artifacts are not large enough to determine the scale of deterioration, only type analysis can be performed. C14 analyses are planned for certain examples.

This paper explains the methods of preliminary cleaning, documentation and analysis implemented before an active conservation process and technique was designated for the obtained waterlogged wooden combs. These preliminary studies helped ascertain the best conservation method for the wooden combs.

* Corresponding author: Y. Akpinar yurdanursu@gmail.com

16th CENTURY WAWEL ARRASES: EVALUATING FIBROIN AND KERATIN DEGRADATION AND PLANNING ITS PRESERVATION

Aksamit-Koperska, M.A.[1*]; Bagniuk, J.[2]; Pawcenis, D.[1]; Chlebda, D.[1]; Łojewska, J.[1]

[1] Department of Chemistry, Jagiellonian University, Cracow, Poland, [2] Jan Matejko Academy of Fine Arts, Cracow, Poland

So-called Wawel arrases is a collection of 16th century tapestries woven in the Flanders and manufactured in Arras, France that was commissioned by the Jagiellons to decorate the interiors of the Wawel Castle in Cracow. Today this collection consists of 137 fabrics, from the original 365 piece group, which makes it the biggest, coherent tapestries set in Europe.

Unfortunately these precious textiles (woven from dyed silk and wool) require conservation work, they are planned to be washed and some threads need to be repaired. With view of that chemical analysis was performed to help understand the degradation process ongoing within the artwork and in order to evaluate the conservation routines.

Silk and keratin degrade mainly by hydrolysis and oxidation of peptide bonds, which may lead to a decrease of polymerisation degree and formation of new functional groups on the polypeptide chain together with liberation of volatile products. Artificially aged model samples of silk and wool were exposed to various environments such as different oxygen and volatile organic products content, all at the temperature of 120°C.

Based on the results gathered with by ATR/FTIR and UV-VIS the degradation markers were proposed. One of them ($E_{AmidI/AmidII}$ Koperska et al 2014) allowed comparison of the degradation rate of both analyzed materials and showed much quicker oxidation of keratin to fibroin. It also gave insight into planning storage for Wawel arrases.

The process of textile washing was also put under scrutiny. Effects of microemulsions and Marseille soap treatment, and dust removal was evaluated by the means of colour, pH and ATR/FTIR derived markers measurement. Laser cleaning and plasma treatment was also looked into as a possible substitute for chemical “wet” cleaning. These preliminary analysis of different washing approaches allowed forming guidelines for future research.

Figure 1 shows tapestry with shield-bearing satyrs and monogram of king Sigismund Augustus (SA), ca. 1555.

Figure 1. Wawel Royal Castle Museum State Art Collection

Koperska, M.A.; Pawcenis, D.; Bagniuk, J.; Łojewski, T.; Łojewska, J. 2014, Degradation markers of fibroin in silk through infrared spectroscopy, Polymer Degradation and Stability 105, 185–196

* Corresponding author: M.A. Aksamit-Koperska mkoperska@gmail.com

FURTHER NON-INVASIVE INVESTIGATIONS ON ANNUNCIATA BY ANTONELLO DA MESSINA TO TRACE THE ORIGINAL APPEARANCE OF THE BLUE VEIL

Alberghina, M.F.[1*]; Barbera, G.[2]; Cacciatore, E.[3]; Prestileo, F.[4]; Schiavone, S.[1]

[1] S.T.Art-Test s.a.s., Niscemi (CL), Italy, [2] Galleria Regionale della Sicilia di Palazzo Abatellis, Palermo, Italy, [3] Assessorato al Turismo, Regione Siciliana, Palermo, Italy, [4] Istituto per la Conservazione e la Valorizzazione dei Beni Culturali (CNR), Roma, Italy

The *Annunciata* painting on wood by Antonello da Messina (XV century), exposed at the Regional Gallery of Abatellis Palace (Palermo – Sicily), was involved in non-invasive investigations (Ultraviolet Fluorescence acquisition, Infrared and False Colour CCD imaging, X-Ray fluorescence analysis) from 2005 to 2007 (Cacciatore et al. 2007; Prestileo and Bruno 2007; Prestileo et al. 2009). The principal aim was to document the conservation state considering the movements of this precious masterpiece for several temporary Italian and foreign exhibitions on Antonello da Messina (2005-2006, New York - Metropolitan Museum; 2006, Rome - Scuderie del Quirinale; 2007, Taormina, Museum of Palazzo Corvaja; 2007, Cefalù – Mandralisca Museum; 2007; Milan - Diocesan Museum).

In 2015, a new diagnostic study was carried out by using Intravedo scanner for IR Reflectography (InGaAs detector) and XRF mapping, in order to investigate, thanks to an innovative equipment, the painting area between the face of the Virgin and the blue veil. This pictorial region, altered in the past by a heavy undocumented cleaning, was not clearly understood during the previous scientific study. Investigations revealed, indeed, that the blue traces in this area are not pictorial integrations, added on the background layer, rather they are residues of the original layer constituting a portion of the veil heavily removed during a XIX century intervention (as supposed by comparison of the historical information and past photos available for this painting).

The investigations were carried out directly *in situ*, at the "Antonello's Room" of the Abatellis Palace, with portable instrumentation, without removing the painting on wood from its showcase.

The new findings, here for the first time presented, have provided an important assumption for a correct historical - artistic reading of the original appearance of the subject and represent a scientific support to clarify the conservation history which leads the painting to its current feature.

Cacciatore, E.; Prestileo, F.; Bruno, G.; Schiavone, S.; Alberghina, M. F. 2007. *Indagini multispettrali per lo studio dei manufatti di interesse storico-artistico: applicazione a due dipinti di Antonello da Messina, in AA.VV., La Vergine Annunciata. Indagini diagnostiche ed ipotesi di restauro a cura del C.R.P.R. della Regione Siciliana, Fondazione Federico II, Palermo, 39-63.*

Prestileo, F.; Bruno, G. 2007. Indagini multispettrali, in P. Biscottini (ed.), Antonello da Messina. L'Annunciata, catalogo mostra "Un Capolavoro per Milano. Antonello da Messina. L'Annunciata", Museo Diocesano, Milano, 4-25 ottobre 2007, Silvana, Cinisello Balsamo, 39-43.

Prestileo, F.; Bruno, G.; Cacciatore, E.; Schiavone, S.; Alberghina, M. F. 2009. *Indagine diagnostica non invasiva sul dipinto su tavola l'Annunciata di Antonello da Messina*, Atti del III Convegno Internazionale La Materia e i Segni della Storia. Scienza e Patrimonio Culturale nell'Area del Mediterraneo, Palermo, 2007. Collana I Quaderni di Palazzo Montalbo 15, Palermo, 733-738.

*Correspondig author: M.F. Alberghina francesca.alberghina@gmail.com

CONSERVATION OF A COLOSSAL STATUE OF ZEUS FROM *SOLUNTUM* (SICILY, ITALY): SCIENTIFIC AND HISTORICAL REMARKS ABOUT PREVIOUS RESTORATIONS

Alberghina, M.F.[1]; Alvarez de Buergo, M.[2]; Martinez-Ramirez, S.[3]; Milazzo, G.[4*]; Schiavone, S.[1]; Spatafora, F.[5]

[1] S.T. Art-Test, Palermo, Italy, [2] Geosciences Institute IGEO (CSIC-UCM), Madrid, Spain, [3] Institute for the Structure of Matter (IEM-CSIC), Madrid, Spain, [4] Milazzo Restauri s.r.l.,Palermo, Italy, [5] Regional Archaeological Museum "A. Salinas", Palermo, Italy

During the first decades of 19th century, the Commission for the Antiquities and Fine Arts supervised many excavations and restorations in the major archaeological sites of Sicily, discovering many important finds around the island. Several of them belong to the archaeological collection of Museo Archeologico Regionale (Regional Archaeological Museum) "A. Salinas" of Palermo. One of the most important finds from this site is the colossal statue of Zeus enthroned, a pseudo acrolithic statue, dated to the 2nd century B.C. and it is one of the few examples of large size statue in Sicily. The statue was discovered in 1825 in the site of the ancient city of Soluntum that is certainly one of the main important archaeological sites in Sicily, not so far from the modern town of Palermo (Sicily).

In 1826, the neoclassical sculptor Valerio Villareale restored the colossal statue of Zeus that was found in fragments, for completing the missing parts with stucco. At the beginning, the state of conservation did not allow to distinguish the original matter from that one of the Villareale completing. The recent conservation gave the opportunity to investigate and to study the statue during each of the stages of the work.

Thanks to a scientific approach, it was possible to investigate the history and to respect the original matter. The conservative activities were aimed to investigate also the restoration matter as a fundamental requirement for a suitable conservation.

Several chemical and structural diagnostic analyses were carried out, both in situ and in laboratory, to deepen into the knowledge of restoration materials, their degradation state and the overlapping with the original surface. In particular, the Ultraviolet Induced Fluorescence imaging, Infrared termography, cover meter relief, X-Ray Fluorescence analysis, UV and Vis optical microscope were carried out in situ to mapping the different materials and to understand the junction method between the original parts and the restoration ones. Supported by the preliminary in situ information, the sampling was realized to deepen into the elemental and compositional characterization of the material used for each restoration stage documented over time. With this aim, optical microscopy (stereomicroscopy and polarizing optical microscopy) scanning electron microscopy (SEM-EDS), FTIR-RAMAN spectroscopy and cross section UV light acquisition were carried out.

The analytical results have given precious information to suggest the historical research for a better knowledge of the conservative history of the statue. This work permitted to increase the knowledge about the restoration process during the neoclassical period, in which it was fixed the basis for the modern process of conservation.

* Corresponding author: G. Milazzo giu.milazzo@gmail.com

PASTERPIECES OF ANCIENT AZERBAIJANI HANDICRAFTS: CARPETWEAVING AND JEWELLERY ART

Alekperova, N.*

Azerbaijan Carpet Museum, Baku, Azerbaijan

In the history of every nation, there is a field of cultural heritage which reflects its rich spiritual world, embodies the inherent traits of self-determination, intelligence, philosophy, aesthetics and philosophy of life of the people. For the Azerbaijani people, this kind of art is the art of carpet weaving. Carpet art is humane in its nature and many-functional for use in the household.

The carpet creates comfort, warms houses, decorates the home interior space, serves as a source of aesthetic pleasure. The carpet is connected with a thousand threads to the literature, architecture, art and miniature arts and crafts of the Azerbaijani people. That is why the carpet is an important object for researches.

Due to its geographical position and favorable climatic conditions, Azerbaijan was one of those places where the prehistoric man lived. Azerbaijan played an important role in the development of human civilization. The development of agriculture and livestock, increasing human demands played the way for the emergence of various forms of art. The artifacts, found during archaeological excavations in the territory of Azerbaijan, show that the carpet was an integral part of people's day life.

Examples of material culture found during excavations in Mingachevir prove that the carpet was made in Azerbaijan in that period. The local burials of I-VII centuries revealed remains of wool yarn and carpets. Ornaments that were used on ancient pottery, reflect the beliefs of the people, their feelings and emotions. These patterns were used in carpets, jewelry and other kinds of arts and crafts of Azerbaijan.

Azerbaijani carpet weaving is a colorful, rich and multifaceted art. Depending on the material, size, density, weaving technique, the main features of the dyeing process, the production locality, carpets are classified into types and groups. These sections are necessary to learn the secrets of carpet weaving.

Critics and scholars of Azerbaijan and foreign countries have studied the Azerbaijani carpet art in their scientific-research work. They studied ornaments, composition, historical development, the secrets of dyeing, technological foundations, pile and flat woven carpets, etc.

Like many types of folk arts and crafts, the main features of carpet and jewelry are their elegant solution, high taste and style of ornaments. All these and seven local carpetweaving schools, as well as development, problems of restoration and conservation, including current trends, were widely studied.

Despite all the innovations in materials, production technologies, aesthetics and design, the carpet is one of the most striking cultural constants. Even the rapid change of lifestyle in the modern period has not changed the essence of the carpet.

*Corresponding author: N.Alekperova naiba1205@gmail.com

SHAKI KHAN PALACE AS SAMPLE OF HISTORICAL-CULTURAL HERITAGE, THE ROLE OF SCIENTISTS AND YOUTH IN IT'S POPULARIZATION AS TOURIST FACILITY

Aliyeva, K.*; Gasimzadeh, G.

Azerbaijan State Academy of Arts, Baku, Azerbaijan

Azerbaijan is one of most ancient centres of world civilization. This fact is proved by number of material culture samples, found while archeological exavations, carried out in the historical territories of Azerbaijan. Here very interesting exhibits, e.g. remains of ancient architectural memorials, toreutics and ceramic works were found. Besides, in the territory of Azerbaijan numerous cyclopean buildings and constructions were discovered also. There are numerous deposits of precious metals (gold, silver), iron, copper, deposits of natural gas and oilfields in Azerbaijan. So, close and neighbouring countries and states, e.g. Assyria, Babylon, Urartu always aspired to conquer these rich land and to seize it's riches and resources. As a rule, the invadors took the artists, working with gold and siver in prison and made them to work for conquests. The artists, who lived in ancient Azerbaijani states, such as Manna, Midia, Atropatena, Albania erected here most beautiful ziggurates and temples in I-III millenium b.c. One of such buildings was erected in Akbatan (capital of Midia) in territory of modern Southern Azerbaijan and the information about that palace is confirmed by Herodotos in his historical books. In different historical periods Achaemenids, Sasanids dynasties of Parsee and Indian origin, governed Azerbaijan. Then, (after VII century) Arabian caliphates, Seljuks (XI century), Mogols (XIII-XIV centuries) invadors adopted rich and ancient Azerbaijani culture, and some of Azerbaijani habits and traditions. E.g. after conquering Midia, Achaemenids asked to build their famous palaces "Persepolis" to Midians and Egyptians.

In Azerbaijan for centuries Azerbaijani masters erected many magnicient palaces. The architectural complexes "Rubi-Rashid" and "Shambi-Gazan" near Tabriz (XIII-IV centuries), "Ali Gapi" (XVII century, period of Shah Abbas I governing), palace "40 Pillars" (period of Shah Abbas II governing) are best samples of that activity. At the end of XVII –beginning of XVIII century in Azerbaijan period of khanates began. Each khan had the aim to build his own palace. "Bayil castle" erected for Shirvanshah dynasty, "Shirvanshah's palace" architectural complex (XIII-XIV centuries), "Agdam Shahbulag Palace" (1751), "Irevan Khan Palace"(1578), "Ganja Khan Palace" (XVIII century), "Shusha Khan Palace" (1751-1822), "Nakhchivan Khan Palace" (XVIII century), Khan Palaces in Derbend, Guba, Baku (XVIII cnetury), Shaki Khan Palace can be included in group of such architectural memorials.

Among those palaces Shaki khan palace is of special importance. This architectural complex preserved it's national specifics till modern times and differs from other palaces by it's oriiginal architectural style. Shaki Khan palace decor very rich and original patterns and plots were used, and in those patterns and plots Tabriz miniature style of XVI-XVII centuries and Gajar painting style are united. All these features are the reason, tha Shaki Khan Palace is considered to be one of centres, which attract tourists.

*Corresponding author: A. Kubra. aliyeva_kubra@mail.ru

RISE AND FALL OF THE CULTURAL MEGALOMANIA IN SPAIN. 1985-2005. 20 YEARS OF GOOD INTENTIONS. CONSEQUENCES AND SOLUTIONS TODAY

Alonso Tak, A.*

Universidad Complutense de Madrid, Madrid, Spain

Economy and Culture have always been intimately related. The study of the economical context is essential to understand any artistic period. Contemporary art is not an exception. The actual crisis has had a deep impact in the conservation of contemporary art, its exhibition and promotion.

In Spain we lived a prosperous period between the middle eighties and the first lustrum of the 21st century. Particularly, arts and culture profited of an enthusiasm of both the political figures and the society. Art was the way to express prosperity and there was a feeling of pride of our cultural background as of our international projection. Tourism increasingly became the most powerful engine of the Spanish economy and ever since, culture and tourism went hand to hand in our vocabulary and the popular belief.

As J.M. Costa exposed in 2014 (Costa, 2014) this general mood lead to a frenetic development of constructions of contemporary museums or institutions. This quote of his could not be more clarifying "*La construcción de museos/centros de arte tuvo lugar en los años de vacas gordas y aún se mantiene esa tendencia cuando no hay ni para mantener a las vacas*" [The construction of museums/art centers occurred in the times of prosperity, (which is said in Spain "fat cows" times) and this tendency still keeps on going even if there is no money to sustain the cows"]. We want to set this sentence as the basis of our paper, in order to explain the elements that formed the Spanish society at that time: economy, politics, social development, idealistic previsions, etc. Also offer an overview of the most remarkable institutions created in those 20 years, their expectations, mission and "reason to be" given at that time; and a reasoned critic of the facts and consequences that we professionals of cultural conservation have to deal with today.

Our conclusion will try to suggest some measures that we think may be positive and useful in order to re-interpret these museums and centers. We have to be able and imaginative enough to take these "exquisite corpses" and reactivate their potential or create new paths of, if not highly successful, at least sustainable institutions. Indeed, we will have to be realistic depending on the case. Let's face the challenge of the creation not ex-nihilo but ex-materia, because sometimes, having something to be trustful to requires a harder exercise of imagination, creativity and efficient resolution. It will not be easy, but what challenge is? So let's "stay hungry, stay foolish" (Jobs, S. 2005).

Costa, J.M. 2014. Mucho museo para tan poco país, www.eldiario.es, http://www.eldiario.es/cultura/politicas_culturales/museo-pais_0_319518510.html

Jobs, S. 2005. Standford Commencement Speech.

* Corresponding author: A. Alonso Tak a.atak50@gmail.com

HISTORIC EXTRACTION OF LIMESTONE BLOCKS FOR THE CONSTRUCTION OF SAN CEBRIÁN DE MAZOTE CHURCH (VALLADOLID, SPAIN)

Álvarez Areces, E.[1*]; Baltuille, J.M.[1]; Utrero Agudo, M.A.[2]

[1] Instituto Geológico y Minero de España (Spanish Geological Survey), Madrid, Spain
[2] Durham University, Durham, United Kingdom

This research work falls within the scope of the project for the R&D&I National Programme (2008-2011), funded by the Ministry of Economy and Competitiveness: *"Archaeology of the 10th-century Spanish Churches: the movement of architectural and decorative models"* (HAR2012-35222), being Dr. María de los Ángeles Utrero Agudo the Principal Investigator.

The purpose of this project was the study of the movement of architectural and decorative models, their introduction, conservation, alteration or copy in the 10th-century mainland Spain, based on the archeological and geological analysis of three churches, a priori, similar and coetaneous: San Miguel de Escalada (León), San Cebrián de Mazote (Valladolid) and las Mesas de Villaverde (Málaga).

For the construction of San Cebrián de Mazote (10th c.) limestone rocks from the Upper Miocene moorlands were mainly used as a structural element, ashlar and masonry. Based on the petrographic study and the field research for the localization of historic quarries, a total of seven extraction areas were identified within a radius of 1,8 km in the building surroundings.

It corresponds to an organized exploitation, having been identified areas where ashlar stone was extracted using the historic methods of grubbing (wedges, shot-hole drilling, etc.) and areas exploited to obtain stone masonry, defined by the upwelling capacity. This extraction areas are directly related to the building, which bring us to its construction system, transportation methods, organization on site, stock of materials, etc.

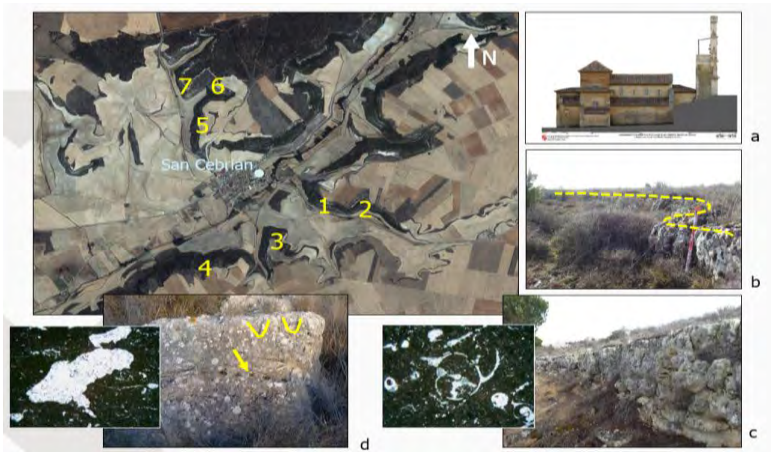


Figure 1. a. San Cebrián de Mazote church, North elevation. b. Area 3. La Horca. c. Area 2 Eastern La Atalaya

	Extraction areas
1	Western Las Atalayas
2	Eastern Las Atalayas
3	La Horca
4	Cuatro Iguadas
5	Suthern El Horcajo
6	Northern 1 El Horcajo
7	Northern 2 El Horcajo

Table 1. Identified extraction areas

* Corresponding author: E. Álvarez Areces e.alvarez@igme.es

NUEVO BAZTÁN (1701-2015), MADRID (SPAIN): MODEL OF INDUSTRIAL TOWNSHIP HERITAGE

Álvarez Gutiérrez, A.*; Ferreiro Lozano, J.; García Bernabé, A.

Master in Conservation and Restoration of Heritage, Universidad Politécnica de Madrid ETSAM, Madrid, Spain

This communication deals with Nuevo Baztán, the first industrial town built in Spain in the eighteenth century by Don Juan de Goyeneche, based on mercantilist Colbert's ideas.

The idea for the project came about as a result of the Final Project for the *Master of Conservation and Restoration of Architectural Heritage* (Escuela Técnica Superior de Arquitectura de Madrid -UPM-). In the analytical phase, the intervention looks into the territory, historical development in urban and social terms, the industrial development, as well as into a restoration proposal. The proposed management and conservation process consists in the restoration of certain buildings, regardless of primal function, boosting intangible culture and local development as a whole. The purpose is not to return the block to an original state, but to recognize and value those elements which have not been altered by contemporary needs.

The new activity program provides the possibility of socially and economically regenerating the urban area: a program with the possibility of expansion, which solvents a specific requirement and serves as an appeal to the urban core. Our answer is found in the wine and gastronomy industry. It is a trade that unifies a manufacturing past with an agricultural present, perfectly compatible with the shape and history of these buildings. This trade serves a new society without forgetting the history of the industrial complex and the essence of the space itself.

The rehabilitation focuses on the buildings that are located in the three main squares, each with different character and with a new activity program. Up until now, the buildings that were projected in a more important way were those that had been completely abandoned. Therefore, the goal of the intervention is to rehabilitate firstly the block located in the northern section of *Plaza de la Iglesia* where there is a winery and historic cellar that need to be recovered along with the original residential functions, through the inclusion of a rural hotel. Secondly, the *Casa de Oficios* would develop a program linked to gastronomy that would give life to the abandoned *Plaza de Fiestas*, recovering its popular character. And finally, the old stables, which are located in *Plaza del Mercado*, would take in wine production and vending, recovering the historical essence of the urban space.

In conclusion, the project aims to revitalize the industrial nature of the town, through restoration measures in architectural and urban heritage. Because of the importance of Nuevo Baztán in the Spanish industrial heritage, this strategy needs to be explained to the population of the town, as well as to the general public.

* Corresponding author: A. Álvarez ajag1988@gmail.com

STUDY OF A NUMISMATIC COLLECTION COMBINING ELECTRON MICROSCOPY, NANOELECTROCHEMICAL AND SPECTROPHOTOMETRY TECHNIQUES

Álvarez-Romero, C.[1]; Doménech-Carbó, M.T.[1*]; Martínez-Bazán, M.L.[1]; Pasíes-Oviedo, T.[2]; Buendía-Ortuño, M.[3], Doménech-Carbó, A.[4]

[1] Instituto Universitario de Restauración del Patrimonio de la Universitat Politècnica de València, Spain, [2] Museo de Prehistòria de València, Spain, [3] Museo Nacional de Arqueología Subacuática, Cartagena, Spain, [4] Departamento de Química Analítica, Universitat de València, Spain

In the present work has been studied part of a numismatic collection that consist of ten copper-based coins from different countries: Malta, France, Great Britain, Portugal and Switzerland and in a timeline spanning from 1776 until 1962.

A multi-technique methodology has been applied for the study of the coins collection that includes cataloging and description of the historical context, characterization of the elemental composition using x-ray microanalysis combined with scanning electron microscope (SEM-EDX), a colorimetric study using spectrophotometry and characterization of corrosion products using “on touch” voltammetry of microparticles (VMP).

Elemental analysis obtained by SEM-EDX confirms that most of the coins are made using a ternary bronze with tin and zinc in addition to copper. Nevertheless, a binary Cu-Sn alloy was found in two of the pieces and other of the coins showed a copper-rich elemental composition. The elemental composition obtained for the set of coins enables to establish correlations between typology of alloy, historical context and provenance. On the other hand, “one touch” voltammetry of microparticles enables characterization of the main minerals forming the thin corrosion layer formed in the surface of the coins that is responsible for the dark color exhibited by the coins, mainly cuprite, tenorite and malachite. These last results have been compared with those from colorimetric measurements obtaining a satisfactory correlation between corrosion layer composition and visual appearance of each coin.

Acknowledgements: Financial support is gratefully acknowledged from Spanish “I+D+I MINECO” projects CTQ2014-53736-C3-1-P and -2-P supported by ERDEF funds. The authors also wish to thank Mr. Manuel Planes and Dr. José Luis Moya, technical supervisors of the Electron Microscopy Service of the Universitat Politècnica de València.

* Corresponding author: M.T. Doménech Carbó tdomenec@crbc.upv.es

THE (IN)VISIBLE BROUGHT TO LIGHT. METHODS AND TECHNIQUES FOR EXTRACTING THE FULL INTERPRETATIVE POTENTIAL IN PAINTING X-RADIOGRAPHY

Alves, S.[1*]; Sousa, M.J.[2]; Sinițaru, A.[3]

[1] Center of Conservation and Restoration (EA-UCP), Porto, Portugal, [2] Center for Science and Technology of Arts (EA-UCP), Porto, Portugal, [3] Romanian Order of Architects (OAR), Bucharest, Romania

120 years have passed since x-radiography started being applied to the study of paintings and few of its processes have changed in their basic fundaments, despite all the improvements regarding materials, techniques, ease of use and the introduction of the digital process. The relevance of this non-destructive area exam still remains unaltered, not only as a method for conclusive answers but mostly as a starting point for raising new questions that can be answered by crossing data gathered from a wide spectrum of a complementary set of exams and analysis. However, the current underuse of the potential information that could be extracted from x-radiographs is quite observable, as it can be witnessed in the several scientific publications that include painting x-radiography. This phenomenon comes as a result of the imaging document not providing any objective qualitative and/or quantitative data as its results depend mainly on the subjective interpretation of each specialist. Therefore, this presentation proposes a dual analysis and systematization process: a technical approach concerning the radiological dimension, followed by new methods and strategies for organizing and reasoning when interpreting painting x-radiographies. The radiological principles involved in this type of examination regarding the properties of x-ray radiation, the way it is produced and the resultant phenomena of its interaction with matter are here explored.

Every radiographic factor is evaluated, such as the nature of the electromagnetic radiation, the instrumental parameters, geometrical and placement issues, the inclusion of additional structures as well as all the different repercussions those have in image quality, beyond the more simple and traditional evaluation of contrast and definition of image. In the reading component of the x-radiographic process, a specific methodology of image comprehension is outlined. An interpretation by layers is proposed, starting with the support until the chromatic layers and the interactivity of the observable phenomena. The data gathered is then subdivided in three major categories, which are: the state of conservation/ageing, the range of materials applied and the techniques implemented. All the information retrieved is then organized by the form of a technical report, that intakes Erwin Panofsky's method of iconographic analysis, comprising three levels of objectivity: the positivist stage with the objective description of the radiopacities of the different image features, the explicative stage which theorizes the existence of such features based on the scientific knowledge of the techniques and materials as well with the consideration of their ageing processes, and the third stage, *the status quaestionis*, where a more speculative and subjective reasoning takes place and where a more widen spectrum of questions is formulated, so they can be answered by complementary scientific methods. Several examples of painting x-radiographies are shown here along with the amount and type of information that was possible to have been extracted from their study, which has already been having a very positive impact for almost a decade, not only in painting conservation but in Portuguese art history itself.

* Corresponding author: S. Alves alves.stefan@gmail.com

THE EFFICIENCY OF TOTAL IMMERSION METHOD TO REMOVE SODIUM CHLORIDE FROM MOKATTAM LIMESTONE

Aly, N.[1, 2]*; Hamed, A.[1]; Gomez-Heras, M.[2]; Alvarez de Buergo, M.[2]

[1] Faculty of Petroleum and Mining Engineering, Suez University, Egypt
[2] Geosciences Institute IGEO (CSIC, UCM) Madrid, Spain

There are various methods to decrease the presence of salts in building stone. These methods known generally as “desalination”, intend to prevent the harmful impact of salt crystallization on building stones. Total immersion in distilled water is a common method of desalination used mainly for sculptures and other isolated material. In this communication this method is used to desalinate 4 cm diameter limestone cylinders which were subjected beforehand to salt loading in a laboratory experimental limestone chamber. Mokattam limestone from Helwan area - Egypt (which is the most common construction material in Historic Cairo) was used in all the experiments.

Salt loading was carried out with a 10% NaCl solution at different temperature regimes (20, 30 and 40 ºC). The effectiveness of desalination was assessed by comparing Ultrasound Pulse Velocity (UPV), rebound hardness test (Leeb) and total porosity accessible to mercury (MIP) before and after immersion. All samples showed a decrease in Ultrasound Pulse Velocity after desalination and an increase in the rebound hardness and Total porosity (MIP) of tested cylinders increased noticeably after desalination treatment and the average pore diameter decreased in all cases. Overall, the properties of the desalinated samples returned to be close to the values of the quarry samples. Therefore, an effective desalination was reached in Mokattam limestone. The implications of this in the conservation of archaeological stone-made artifacts are discussed.

*Corresponding author: N. Aly neven.ali@suezuniv.edu.eg

EVALUATING THE SALT CONTENT WITHIN BUILDING STONES OF AL-AZHAR MOSQUE IN HISTORIC CAIRO (EGYPT)

Aly, N.[1]*; Hamed, A.[1]; Gomez-Heras, M.[2]; Alvarez de Buergo, M.[2]

[1] Faculty of Petroleum and Mining Engineering, Suez University, Egypt,
[2]Geosciences Institute IGEO (CSIC, UCM) Madrid, Spain

Al- Azhar is one of the oldest mosques in historic Cairo. It was founded by the Fatimids in 970 AD. The mosque is constructed mainly with dolomitic limestone. Al-Azhar mosque shows various forms of deterioration, such as flaking and breakdown of stone surface. These deterioration forms are related mainly to the presence of salts within the stone material (Fig.1).

Ten core samples were extracted from different façades of the building to include both deteriorated and preserved surfaces and also to sample both indoor and outdoor environments. The mineralogical composition of the samples was assessed by using X-ray powder diffraction (XRD). The samples were also analyzed by using Scanning Electron Microscope (SEM) and Ion Chromatography (IC) to evaluate morphology and salt content.

The results showed that salts are found in both outdoor and indoor samples and the concentration of salts (mainly chlorides, sulfates and nitrates) increased in the deteriorated samples.

Figure 1. The effect of salt weathering on the stone surface

* Corresponding author: N. Aly neven.ali@suezuniv.edu.eg

"MINIMOS", A SERIES OF MIKEL DIEZ ALABA: REINTERPRETATION OF THE LANDSCAPE IN ORDER TO PRESERVE THE NATURAL HERITAGE

Anthonisen-Añabeitia, I.; Cárdaba-López, I.*

University of the Basque Country UPV/EHU, Leioa, Spain

This study revolves around the work of the Basque contemporary artist Mikel Diez Alaba. This research is specifically based on the series called "Minimos", which gathers up to 144 small size pieces made out of acrylic paint applied on printed images. This collection was displayed on the Museum of Fine Arts of Bilbao during 2014.

Despite the influence of the British figurative painters at the beginning of his career, in 1972, the artist obtained an award from Joan March Foundation and moved to Paris; disappointed with the live in such a huge city, Diez Alaba decided to settle in the countryside.

In 1981 he moved to Minorcan Balear Islands, where Diez Alaba's technique became more gestural and abstract in conception. The motif in "Mínimos" features the Minorcan landscape. This series depicts different views of the island, showing the calm and peacefulness inherent of the natural heritage of this territory. "Minimos" is important as a document of the main natural good of Minorca and its conservation is vital to preserve both, the artwork and the natural heritage.

The main objective is to point out the conceptual aspects regarding the cultural and natural heritage implicit in the artist's creations. The former, refers to the "Minimos" series and its materiality, considering that the conservation issue concerns Díez Alaba; the latter, involves the landscape that inspires the aforementioned work and its evolution.

STAGE	LEVEL	DESCRIPTIVE	ABSTRACTION	CONSERVATION
1		**Specific landscape**	The natural scenery itself	Changes over the years (human activity)
2		**Photography of a specific landscape**	The natural scenery itself captured in a specific moment	Changes over the years (materials degradation)
3		**Artist´s view of the landscape (artwork)**	Representation of the natural scenery in a specific moment	Changes over the years (materials degradation)

Table 1. In "Mínimos" we find three levels: Descriptive level of the heritage (landscape, photography and artwork); Abstraction from nature to its interpretation; Conservation of the materiality on each stage.

Figure 1. Photograph of the Landscape

Figure 2. Artist's view of the landscape (artwork)

*Corresponding author: I. Cárdaba-López irene.cardaba@ehu.eus

CONTEMPORARY FACE-MOUNTED PHOTOGRAPHS: A NEW CONSERVATION CHALLENGE

Arenas Patiño, M. [*]**; García Fernández-Villa, S.**

Faculty of Fine Arts, Complutense University, Madrid, Spain

As is well known, in the last few decades, the presence of photographs and digital prints in contemporary collections has increased considerably (Pénichon, 2011). Nowadays, the range of photograph mountings is numerous and a wide range of materials can be used in their manufacture with striking aesthetic results. Among them, face-mounting known as Diasec® is one of the most widely used and its process is protected by the patent system (Sovilla-Bruhlhart, 1970-1973). However, they have specific conservations problems in terms of stability, due to the materials nature, their manufacture process, as well as other assembly issues (Jürgens, 2001). This study addresses the need to increase the knowledge of these new photo mountings, usually unknown to the conservator.

The research includes an extensive documentary study that covers original patens of invention (Segel, 1983; Attila, 1989; Cesar, 1997) as well as the interviews with various artists and laboratory technicians. The purpose of these interviews is to know first hand the different conservation problems that have been detected in this type of works.

Simultaneously, scientific analyses of face-mounted photographs are being conducted in the Materials Laboratory of the Faculty of Fine Arts, University Complutense de Madrid. They include accelerated aging tests of the materials as well as analysis revealing their material nature, structure and morphology. They include accelerated aging of the materials used in face-mountings and several analysis revealing their material nature, structure and morphology, using techniques as FTIR-ATR, MO, ME, MEB (BSE) and colorimetric analysis. Also, it has carried out an assessment of its long-term performance through the application of artificial accelerated aging. They include variables as temperature (T), temperature and humidity (T/H), ultraviolet (UV) and both xenon and the combined action of T / H and bow-xenon protocol (aging test standard ISO 9142: 2003). Once all these trials are studied physical and chemical changes undergone by the materials after aging are going to be studied, in order to identify changes and their effect on the conservation behavior.

Attila, K. (1989) *Method and apparatus for mounting photographic prints,* WO1989011681.
Cesar, C. (1997) *Archival photoprint laminate.* Patent US 5,595,797. EP 0 845 707.
Jürgens, M. (2001) *Silicone Rubber Face-Mounting of Photographs to Poly (methyl methacrylate […]* (http://atelierdeimpressao.com.br/Queens_Thesis_Juergens.pdf)
Pénichon, S. *et al.* (2011) 'Práticas de montagem de fotografías contemporáneas' in *Cuadernos Técnicos de Conservaçao Fotográfica* 7
Segel, J.M. (1983) *Laminate to extend the life of photographs*. US Patent 4,378,392.
Sovilla-Bruhlhart, H. (1970) *Perfeccionamientos en Paneles-soporte para pruebas fotográficas o impresas.* Patent application number P0380091
Sovilla-Bruhlhart, H. (1973) *Mit einer Trägerplatte verbundenes Bild*. Deutsch Patent DT 2256656.

* Corresponding authors: M. Arenas mireya.arenas90@gmail.com

DOCUMENTATION AND SURFACE CLEANING TESTS OF A 19th CENTURY FIGUREHEAD

Arnoriaga, A.*

Escuela de Arte y Superior de Conservación y Restauración de Bienes Culturales in the specialty of sculpture, Valladolid, Spain

Figureheads are wooden sculptures that served both for decorative purposes as well as a means of identification for most vessels from the 16th to the 20th century. This poster briefly illustrates a study currently being carried out on a 19th century figurehead (MMM_4154) located at the Malta Maritime Museum. The aim of this study is to show the importance of analysing in depth through scientific methods the said artefact before proceeding with the necessary conservation and restoration interventions. The study will be concluded in a final bachelor project made possible through two consecutive Erasmus scholarships, conducted at the conservation laboratories of Heritage Malta in Bighi (Malta).

The documentation and preliminary investigations were carried out under the supervision of Anthony Spagnol, Principal conservator of paintings and polychrome sculpture, and Matthew Grima and Roslyn Debattista, from the Diagnostic Science Laboratories. The study demanded the collaboration of other professionals at Heritage Malta. Scientific investigations included X-ray radiography, UV, (μ-XRF), pigment characterisation, wood identification, study of the action of fire on this figurehead, biological attack, Fourier Transform Infrared Spectroscopy (FTIR), microscopic examinations of stratigraphies (under normal white light and UV fluorescence) and finally a photogrammetry 3D and virtual reconstruction of the hypothetical original state of the figurehead.

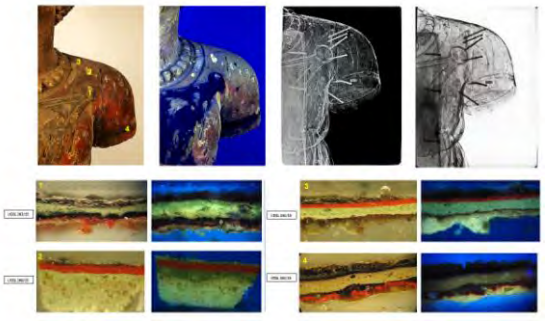


Figure 1. Example of some of the tests on the MMM_4154 figurehead Malta Maritime Museum, Heritage Malta. Detail of the left shoulder. From left to right: (top) normal VIS photograph, UV, X-ray radiography, colour inversion filter image and (bottom) stratigraphy (normal white light and UV fluorescence)

Following documentation and scientific analysis, other preliminary investigations were carried out to establish a tailor-made conservation treatment proposal. Surface cleaning tests with an adjusted conductivity and pH value proved successful in removing a thick layer of dust, grime and soot, following the methodology presented by Richard Wolbers. The cleaning of the copper-based gilding area on the chest proved to be the most challenging. Different adhesives were also tested in order to establish the materials and methodology for the consolidation and re-adhesion of the fragile and delicate polychromy.

* Corresponding author: A. Arnoriaga aranarnoriaga2@gmail.com

MECHANICAL PROPERTIES OF LIME MORTAR WITH ADDITIONS OF POWDERED CACTUS FIBERS AND THEIR MECHANICAL MASONRY CONTRIBUTION

Arreola-Sánchez, M.[1*]; Martínez-Molina, W.[2]; Alonso-Guzmán, E.M.[2]; Chávez García, H.L.[2]; Lara-Gómez, C.[2]; Torres-Acosta, A.A.[3], Bernabé-Reyes, C.[1]; Velazquez-Perez, J.A.[1]; Ruiz Ruiz, R.[1]; Arguello-Hernández, S.C.[1]

[1] Laboratorio de Materiales, Facultad de Ingeniería Civil, Universidad Michoacana de San Nicolás de Hidalgo, Morelia, Michoacán, México, [2] Cuerpo Académico Consolidado CAC-147-UMSNH, Laboratorio de Materiales, Facultad de Ingeniería Civil, Universidad Michoacana de San Nicolás de Hidalgo, Morelia, Michoacán, México, [3] Instituto Mexicano del Transporte, Secretaría de Comunicaciones y Transportes, Sanfandila, Santiago de Querétaro, México

The Mexican pre-Hispanic cultures used lime mortars of great quality using organic additives in their blends, mainly from plants, according to Álvarez et al. (2009). This knowledge was transmitted from the Spanish Missioners, during the Colony era. During this era, lime continued to be used in important buildings, which until today, have resisted time and the force of nature (i.e. high humidity and temperature in the costal tropical zones, earthquakes in the central part of Mexico), (Afacal.com. 2009).

This work is an investigation into the use of powdered dehydrated cactus fibers as additive in lime mortars with 1:3 weight ratio, lime:sand. Their performance under different stresses such as compression, shear, bending and tension were determined at different ages, along with a comparison between piles of masonry bricks, bonded with lime mortar, added with the same cactus fibers and batteries with the same characteristics, but coated on both sides with the mentioned mortar. The materials used were lime, river sand sieved between mesh No. 16 and 30, and dehydrated pulverized cactus fibers, bricks and drinking water. Ages test mortars were at an early age of 7, 14, 28 and 35 days, and later ages of 473 and 504 days. Mortar was prepared under controlled laboratory conditions, with addition of 1% of cactus dehydrated fibers sprayed on the weight of lime; water was added until 90% workability. Mortar was characterized, as well as the raw material, by the standards of the American Society for Testing and Materials (ASTM) and the results were compared against the Building Michoacan Codes.

The use of dehydrated cactus fibers as additive increases considerably the mechanical resistance of mortar and the masonry mainly at late ages.

Álvarez Pérez, A., E.M. Alonso Guzmán, J.A. Bedolla Arroyo, 2009: El tapial y los morteros de cal en las construcciones históricas de Tiripetio (Morelia, México), Revista de la Sociedad Española de Mineralogía Macla nº 11.
www.ANFACAL.com.mx, website of the National Association of Manufacturers of Lime, A. C., 2009.

* Corresponding author: M. Arreola Sánchez marreolas09@gmail.com

USING THREE DIMENSIONAL PRINT FOR RECONSTRUCTION OF HISTORIC GLASS OBJECTS

Bahrampoor Sh.*; Karimy, A.H.

Faculty of Conservation, Art University of Isfahan, Isfahan, Iran

Current method of reconstruction of lost parts in historic glass objects is using transparent Epoxy resins and Silicon molds (Davidson, 2006) or Paraloid B72 (Koob et al., 2011).

Due to problems related to the reconstruction of lost parts in this process for molding, casting and formation of reconstructed parts with Epoxy or Paraloid, the present research aims to propose an efficient method as an alternative using 3D printer. This tool which is using for different cases in heritage preservation (Scopigno et al., 2014, Siotto et al., 2015), has the least intervention and destruction and also high accuracy as a substitute to current methods of reconstruction (Antlej and Zvarl, 2010). Our main questions are as follows: How is the condition of 3D reconstruction facilities for lost parts of glass objects in Iran? What are the technical and practical advantages and disadvantages of 3D printer in this process? How is the strength and yellowing quality of suggested polymers for reconstruction?

The research finalized through verifying both current and 3D technology methods for reconstruction of lost parts. The methods are: filling with Epoxy and Acrylic resin, Plexiglas and PET methods (Martinez et al., 2011) as a suggestion. Samples were tested for yellowing and Pin on disk. The results showed that Acrylic resin in 3D printer is a proper substitute to reconstruction of the lost parts of glass objects and Plexiglas using 3D technology method (laser and CNC) ranked as the second.

Antlej K. and Zavrl V. 2010. "The Use of 3D technologies in Cultural Heritage Communication." Drugi Međunarodni simpozij "Digitalizacija kulturne baštine Bosne i Hercegovine", Zbornik radova: 39-44.
Davison, Sandra. 2006. Conservation and Restoration of glass. Butterworth Heinenemann, London.
Koob, S.P., Benrnubi, S., Van Giffen, R.n., Hanna, N. 2011. An Old Material, a New Technique: Casting Paraloid B-72 for Filling Losses in Glass. Adhesives and Consolidants for Conservation, 17-21.
Martinez, B. Pasies, T. and Peiro M. A.2011. Reversibility and minimal intervention in the Gap-Filling process of archaeological glass. E-conservation magazine.20:7.
Scopigno, R., Cignoni P., Pietroni N., Callieri M., and Dellepiane M..2014. "Digital Fabrication Technologies for Cultural Heritage (STAR)." InEurographics Workshop on Graphics and Cultural Heritage, 75-85.
Siotto, E., Dellepiane M., Callieri M., Scopigno R., Gratziu C., Moscato A., Burgio L., Legnaioli S., Lorenzetti G., and Palleschi V. 2015. A multidisciplinary approach for the study and the virtual reconstruction of the ancient polychromy of Roman sarcophagi. Journal of Cultural Heritage 16-3, 307-314.

* Corresponding author: S. Baharampoor shimabahrampoor@yahoo.com

SPANISH INVENTORY OF HISTORIC QUARRIES USED IN ARCHITECTURAL HERITAGE (INCHAPA)

Baltuille, J.M.*; Álvarez Areces, E.; Fernandez Suárez, J.

Instituto Geológico y Minero de España (Spanish Geological Survey)
Department of Geoscientist Infrastructure and Services, Madrid, Spain

Given the assets of the National Architectural Heritage and the variety of lithologies used for its construction and, in many cases, its advanced state of deterioration, it is imperative to study these materials as well as their geological source and the quarries where the stones were extracted.

The Instituto Geológico y Minero de España (Spanish Geological Survey), with in its research areas related to architectural heritage, natural stone and historic quarries, is developing the project National Inventory of Historic Quarries (INCHAPA), started in 2014.

The most relevant purposes are as follow:

- Identification of stone materials used for the construction of the Assets of National Interest.
- Localization and inventory of historic quarries and/or historic extraction areas related to the construction of the Assets of National Interest Heritage.
- Detailed cartography of extraction areas, including georeferenced information of preserved tool marks.
- Definition of strategies for the preservation of historic quarries.

This Project is interrelated to other projects developed in the Module of Natural Stone and Architectural Heritage of the IGME, such as the Scientific and Technical Network Construrock as well as the geoscientific Information System applied to architectural heritage.

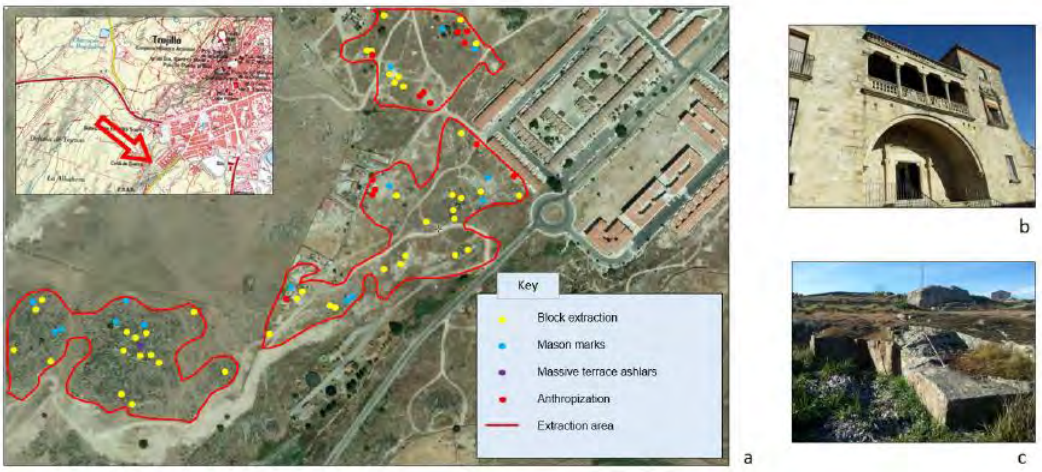


Figure 1. a. Historic extraction area. Identification and georeferencing information of tool marks. B. Juan Orellana Pizarro Palace. Trujillo. C. Historic extraction area associated with the architectural heritage of Trujillo (Cáceres)

*Corresponding author: J.M. Baltuille jm.baltuille@igme.es

BIOCIDE TREATMENTS ON LIMESTONES BASED ON SILVER NANOCOMPOSITES

Becerra, J.*; Zaderenko, A.P.; Ortiz, P.

Department of Physical, Chemical and Natural Systems. Universidad Pablo de Olavide, Seville, Spain

Biopatina formation and biodegradation of stones are common and undesirable deteriorations in historical buildings. Restorers have been using different treatments, especially chemical methods, to prevent biodeterioration. These treatments often have disadvantages as low long-term effectiveness, high toxicity for health and environment or incompatibility with original substrate.

Advances in nanotechnology are enabling to develop new treatments based on nanoscale properties of different materials. For instance, silver nanoparticles (AgNPs) have remarkable biocide properties, according to Caro et al (2015).

In this research, different treatment biocides based on silver and titanium dioxide nanocomposites have been studied on calcarenite stones from Utrera's quarry (Seville, Spain), limestones employed in historical buildings in the south of Spain, for example the Town Hall of Seville (XV-XIX Century). Two AgNPs syntheses described in Caro et al. (2015) and Flores et al. (2010), whose principal difference is trisodium citrate as stabilizer, have been employed. The nanocomposites obtained using citrate have shown higher colloidal stability and reduced hydrodynamic diameter according to Dynamic light scattering (DLS) and ultraviolet-visible (UV-Vis) spectrophotometry results, as well as better biocide effect.

Optimum applications for stone materials have been tested to minimize chromatic alteration after application of treatments without cut down the biocide effectiveness. Silver-titanium dioxide (Ag/TiO_2) nanocomposites stabilized with citrate are promising for application on limestones because have decreased the biopatina appearance in more than 50% with a final color increase of around 10%, color modification that can be accepted for cleaning process according to Ortiz et al. (2013).

Caro, C.; Gámez, F.; Sayagues, M.J. et al. 2015. $AgACTiO_2$ nanoparticles with microbiocide properties under visible light. Materials Research Express 2 (5), 055002.
Flores, C.Y.; Diaz, C.; Rubert, A. et al. 2010.Spontaneous adsorption of silver nanoparticles on Ti/TiO_2 surfaces. Antibacterial effect on Pseudomona aeruginosa. Journal of Colloid and Interface Science 350 (2), 402-408.
Ortiz, P.; Antúnez, V.; Ortiz, R. et al. 2013. Comparative study of pulsed laser cleaning applied to weathered marble surfaces. Applied Surface Science 283, 193-201.

* Corresponding author: J. Becerra jbeclun@upo.es

RESTORATION OF THE PORTICO OF THE CASTLE OF VILLA DEL RÍO HERNÁN RUÍZ I, VILLA DEL RÍO, CÓRDOBA (SPAIN)

Bejarano Navajas, F.G.*; Cano Juan, J.

Provincial Deputation of Córdoba, Córdoba, Spain

The Castle of Villa del Río, cataloged according to Spanish Historical Heritage Law as B.I.C, has on its facade a later-gothic portico built due to the purpose of the building as church during sixteenth century.

This portico has been attributed to Hernán Ruiz I, patriarch of the most important saga of architects of that period.

It presented a so worrying state of conservation, produced especially by previous interventions (the most damaging was the 86's one) contravening many articles from the Historical Heritage Law, as well as the restoration charts valid at that time.

The Portico was made of calcarenite rock, and many blocks were completely disintegrated, with very high soluble salt content whose origin was from gray cement applications. In addition, a biological attack spread through much of the surface of the portico.

Monument was studied through DRX, MOP, SEM and SAV analysis, grey cement applications was removed and the biologic attack neutralized, making later a photonic cleaning with LASER. The high salt content was normalized and disintegrated rock was consolidated, as well as old remains of polychromy. Restoration was finalized with a volumetric reintegration according to current restoration standard.

Figure 1. Portico after intervention

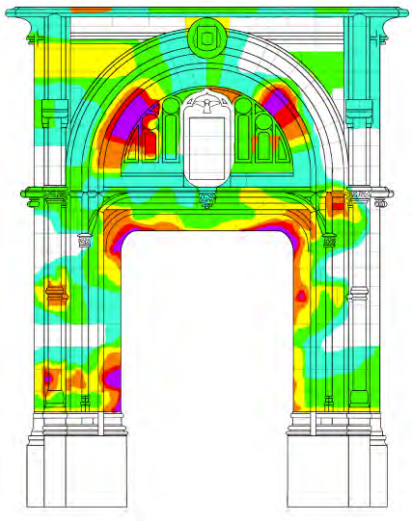


Figure 2. Mapping of initial salt content

*Corresponding author: F. G. Bejarano Navajas fcogabrielrestauro@gmail.com

MONITORING THE TRADITIONAL GYPSUM CALCINATION PROCESS

Bel-Anzué, P.[1*]; Sáez Pérez, M.[2]; Almagro, A.[3]; Rodriguez-Navarro, C.[1]

[1] Dept. of Mineralogy and Petrology, Faculty of Science, University of Granada, Spain, [2] Dept. of Architectural Buildings, (UGR) University of Granada, Spain, [3]School of Arabic Studies (CSIC), Granada, Spain

Gypsum is typically used as a finishing material with a primary aesthetical function. However, and despite its assumed poor mechanical behavior, it is also found as a structural material in several ancient constructions (Almagro, 1986).

The specific conditions during calcination can yield different products after the same original raw gypsum (stone), such as α-hemihydrate, β-hemihydrate, anhydrite I, anhydrite II, anhydrite III, and many multi-product mixtures. Depending on the calcination product(s), the properties of set gypsum (after its re-hydration upon mixing with water) can vary significantly. For instance, it has been found that set α-hemihydrate can achieve a compression strength four times higher than concrete (Arredondo, 1961; Ye et al, 2011). Unfortunately, once rehydrated, it is impossible to estimate the mineralogical composition of the original calcined product. This is a handicap to replicate the specific properties of gypsum used in the past. From an architectural conservation point of view, it would be desirable to gain an insight on how ancient masons were able to achieve the superior properties of gypsum used as a structural material (columns and master walls) in old buildings, such as those located around Teruel (NE Spain). Considering the current high demand of gypsum for heritage restoration/conservation, we focused our investigation on how to obtain a calcined product with properties as similar as those of structural gypsum found in such ancient structures. For this task, we have analyzed the conditions (T, pCO_2 and pH_2O) for the traditional production of gypsum in an oven built according to the ancient tradition transmitted over generations in the area of Teruel. Research on gypsum calcination using traditional ovens (Monesma, 2006; Mahorad, 2002) have provided detailed information that we can contrast with the know-how implemented by the old masons in this NE region of Spain, that currently perform gypsum calcination in traditional ovens.

Here we show how this type of traditional ovens are dimensioned and constructed and how such information enables us to parameterize the temperature, pressure and moisture during the calcination process and the relation between these parameters and the final stregh of set gypsum. This study thus represents the first step to replicate conditions for improving gypsum performance as a structural material in heritage conservation interventions.

Almagro, A. 1986. El yeso material mudéjar. Actas III Simposio Internacional Mudejar. 453-457
Arredondo, F. 1961. "Estudio de materiales. II. El yeso". ITCC. CSIC. Madrid.
Maorad, A. y Rivas, F. 2002. Técnicas Tradicionales de Construcción en Aragón. Archivo de Etnogáfico de Los Monegros.
Monesma, E. 2006. "Técnica de construcción de los hornos de yeso". Serie Audiovisual- La construcción tradicional. Escuela Oficial de Aparejadores. Huesca
Ye Q., Guan B., Lou W., Yang L., Kong B. 2011. Effect of particle size distribution on the hydration and compressive strength development of α-calcium sulfate hemihydrate paste. Powder Technology 207, 208–214.

* Corresponding author: P. Bel-Anzué pedro.bel.anzue@gmail.com

CONSERVATION PROBLEMS OF CONTEMPORARY PUBLIC SCULPTURE IN THE CITY OF GRANADA, SPAIN

Bellido Márquez, M.C.*

University of Granada, Granada, Spain

The work of contemporary urban sculptures is an integral element of the landscape of the city and representative of its culture. However, sometimes the need to preserve and properly restore of these kind of works is neglected, leading to the existence of public sculpture with bad status of conservation which occupy urban areas (roundabouts, parks or squares) without these places constitute a suitable location for them, because in them the works remain bad conservative conditions, and these effects are adverse to its conservation and safeguarding.

Therefore, the objetive of this study is to determine the conservation status of several public sculptures situated in the city of Granada, by Miguel Moreno, which currently have the need to improve their conservation, being restored or optimizing its conditions of preservantion.

The results of this research allow to present a preliminary study of the alterations of works, evaluating its damages and detection of possible deterioration agents that affect them, also provide a proposal for intervention to reduce these issues and lines of preventive action protocol.

In conclusion, there is a significant need to improve the conservation of these public sculptures and renew its image also will improve the image of the city, because this sculptures are elements that are integrated into the urban fabric and it make the city closer to the citizen.

*Corresponding author: M.C. Bellido Márquez cbellido@ugr.es

IDENTIFICATION AND PETROPHISICAL CARACTERISATION OF BUILDING MATERIALS USED IN THE CONSTRUCTION OF THE ARCHITECTURAL HERITAGE OF BIZERTE CITY (TUNISIA)

Ben Amor, Y.; Zoghlami, K.*

Université de Carthage, Faculté des sciences de Bizerte, Département de Géologie, Tunis, Tunisie

The city of Bizerte in ancient times knew two big historic periods. The first corresponds to a first phase of implantation under the Punics, followed to the period of reshaping by the Roman and the Byzantine civilizations. In spite of the preservation efforts, these monuments are in a disturbing state of degradation.

The aim of this work is to determine the origin of the building materials of the studied monuments and to supply useful petrographical and petrophysical information for understanding the mechanisms of stone decay. This information is necessary to propose solutions of preservation and restoration adapted to the specificities of these sites. To achieve this goal, an analysis of the geological context was carried out to localize ancient quarries accompanied by a sedimentological study to identify the exploited geological formations. A systematic sampling was carried out to correlate ancient quarries with the corresponding buildings and to perform the posterior petrophysical tests of the extracted materials.

Geological and petrographical study showed that historical building were essentially built with ancient quaternary sandstones tyrrhenian to Wurm in age with outcrops all along the northern coast of Bizerte, where several quarries were identified. Occasionally, two other types of lithologies were used as building stones and they correspond to two varieties of oligocene sandstones and an eocene white limestone. Along Bizerte's coast, the Tyrrhenian deposits lie in discordance on the Eocene, Oligocene and Miocene series and even some outcrops of the Oligocene sandstones can be still observed in the city of Bizerte, we could not localize ancient quarries. Results showed that Oligocene sandstone and Eocene limestone identified in Bizerte's monuments come from the same quarries exploiting the calcarenite. In fact, when exploitation fronts of calcarenite reach the substratum (Oligocene and Eocene) some materials were extracted. This explains the sporadic appearance of Oligocene and Eocene materials in Bizerte's ancient buildings

Petrographic analyses showed that the quaternary sandstone was a high porous bioclastic calcarenite partially cemented by calcite. The Oligocene sandstones show two petrofacies, a brown quartz-arenite cemented by iron oxide and ochre-green colored sandstone cemented by calcite. Finally, the Eocene limestone corresponds to a fine-grained globigerine wackestone. Laboratory analyses to determine the petrophysical behaviour are in progress.

*Corresponding author: K. Zoghlami karimazoghlami@hotmail.com

CHARACTERIZATION AND STUDY OF LIGHT STABILITY ON CONTEMPORARY ENCAUSTIC PAINT BRANDS

Bernabé García, A.[1*]; Doménech Carbó, T.[2]; Osete Cortina, L.[3]

[1] Universidad Politécnica de Valencia, Spain, [2] Instituto de Restauración del Patimonio (IRP), Valencia, Spain, [3] Instituto de Restauración del Patimonio (IRP), Valencia, Spain

The restoration of encaustic paintings is a field little studied. Restorers specialized in this type of material have undertaken studies on specific artworks and its alterations, such as the well-known Fayum portraits or Roman wall paintings. Over the last decades, researchers have conducted various studies intending to chemically characterize these artworks, trying to unravel the mysteries surrounding encaustic technique and its definition.

However, contemporary art entails other peculiarities. Artists use techniques which lie far from the old recipes of encaustic paint, opting instead for commercialized products which offer a much easier acquisition and a simpler use. Nevertheless, these paint brands, commercialized as "traditional encaustic paint", do not indicate objective data about its chemical composition, durability or stability over time.

The present study concerns the results of the characterization of two encaustic paint brands by FTIR and GC-MS and an evaluation of changes due to exposure to UV light, by colorimetry, optical microscopy and mechanical tests. The goal is to compare the two products in terms of their chemical composition, relative to previous studies conducted on traditional encaustic paint and its deterioration under extreme light conditions. All this in order to initiate a study of contemporary encaustic paintings conservation.

After analyzing both paint brands, we find ourselves in the position of confirming that their chemical composition make them significantly different. The first encaustic type corresponds to what we might call "traditional academic encaustic paint". That is, a combination of beeswax, dammar resin and pigment. Meanwhile, the other encaustic type, defined as "water-soluble encaustic", has great similarities to the ancient recipe of Punic wax or wax saponified, which the ancient writers Pliny and Vitruvius spoke about.

Once the results being evaluated, we have observed that one paint brand is more sensitive to aging than the other one. This research clearly shows that we are facing two different concepts of encaustic paint, which brings us to the conclusion that their level of deterioration over time will also present differences.

* Corresponding author: A. Bernabé García anabernabegarcia@gmail.com

ARCHAEOLOGISTS AND CONSERVATOR/RESTORERS: A TEAMWORK NEEDED FOR THE STUDY AND CONSERVATION OF ARCHAEOLOGICAL HERITAGE. THE EXAMPLE OF AN IBERIAN FUNERARY URN

Bertral, A.[1*]; Belarte, M.C.[1,2]; Noguera, J.[3]

[1] Institut Català d'Arqueologia Clàssica (ICAC), Tarragona, Spain, [2] Institució Catalana per a la Recerca i Estudis Avançats (ICREA), Spain, [3] Universitat de Barcelona (UB), Barcelona, Spain

In this communication, we intend to briefly present the results of the restoration of the archaeological material recovered from the excavation of the Iberian necropolis of Les Esquarterades (Ulldecona, Tarragona).This research is framed within the project *"El primer mil·leni AC als territoris del curs inferior de l'Ebre: la formació, desenvolupament i dissolució de la cultura ibèrica" (The first millennium BC in the territories of the lower Ebro river: formation, development and dissolution of the Iberian culture)* and is led by researchers from the University of Barcelona (UB) and the Catalan Institute of Classical Archaeology (ICAC).

It deals with the problems related to the conservation and restoration of the remains from the close and necessary collaboration between archaeologists and conservator/restorers, in order to extract as much information as possible for their study, and to keep them in a well-preserved state.

To do this, we will focus on the specific example of one of the urns unearthed in the above-mentioned necropolis, describing the whole process from its discovery to the laboratory tasks. The selected urn was recovered as a block to facilitate and enable its careful excavation in the laboratory. It was previously submitted to CT scans and X-rays (Figure 1), which provided valuable information for both archaeologists and conservator/restorers. Indeed, the previous knowledge of the contents of the urn allows an accurate better planning of the best strategy to protect the funerary goods contained in it.

Finally, it aims to develop the idea of multidisciplinary work in the field of archaeological restoration and conservation. We want to make special reference to the role of the conservator/restorers within the research team. Therefore, we will present the main problems posed by the recovered materials –most of them metal items– as well as the specific treatments applied to solve them.

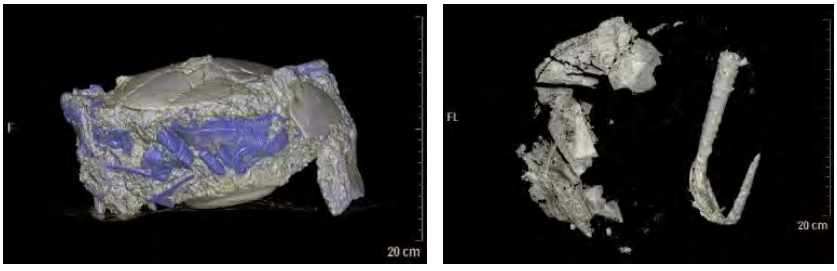


Figure 1. Two visions of tomography of the funerary urn of Les Esquarterades

*Corresponding author: A. Bertral abertral@icac.cat or abertral@yahoo.es

WARTIME DAMAGE TO THE CULTURAL HERITAGE AND CROATIAN EXPERIENCE IN EXPERTS EDUCATION AND RENOVATION OF DAMAGED HERITAGE

Besvir, D.[1,2]*

[1] University of Dubrovnik, Croatia, Department for conservation and restoration,
[2]Croatian Conservation Institute, Zagreb, Croatia

Wartime damage and damage to the cultural heritage in Croatia during the 1990s were extremely extensive. Part of the cultural heritage had been evacuated from the war zone to secret locations and depots all over Croatia. The evacuation was carried out in the organization of experts of Ministry of Culture, Croatian Conservation Institute, local fire departments and civil organizations. Depots were organized in monasteries, palaces and government buildings away from war activities,+ with equipment for the maintenance of microclimate conditions which are supervised by experts of Croatian Conservation Institute.

Croatian national heritage, especially the churches, museums and architectural complexes were extremely damaged. 1100 churches were destroyed and works of art from 100 state, regional and local museums were destroyed or stolen. However, even today, 20 years after the war, Croatian experts are still searching for many parts of national and European heritage. Many historic city centers, castles and medieval, renaissance and baroque fortresses were destroyed (Ilok, Vukovar, Osijek, Karlovac). Many renaissance mansions and villas with gardens and arboretums in Dubrovnik area were damaged.

Simultaneously with organization of secret depots for storing evacuated heritage, it was necessary to organize restoration workshops and education for experts who would work on fixing the damage and rebuilding the devastated heritage, and to ensure the conditions for professional storage and documentation of heritage. Croatian Conservation Institute, as the central institution, has organized symposiums and workshops for restorers as well as to acquire new knowledge and skills during the restoration of badly damaged heritage. At that time, a whole generation of restorers adopt the knowledge, skills, new technologies, materials and ethical principles in the manipulation of cultural monuments.

In the post-war period, the Croatian Conservation Institute opened a new restoration workshop in collaboration with experts from Germany, Austria, France, Britain, Italy, Switzerland and Canada. Croatian Conservation Institute today has nine workshops with departments for architecture, wooden polichromy, painting, paper, historical textile, metal, stucco and stone. Departments and study programs for the training of restorers and conservators were established at the Academy of Fine Arts in Zagreb, Split, and at the University of Dubrovnik. At universities are studying the future restorers specialists for polychrome wooden sculpture, painting, metal, stone, paper, leather, historic textiles, historical plaster and stucco and architects.

Today, Croatian experts have a lot of experience in organization and protection, evacuation and reconstruction of damaged heritage.

Good organization and timely response were crucial for saving the parts of the heritage and for its preservation for future generations.

*Corresponding author: D. Besvir dbesvir@h-r-z.hr

STUDY OF CANVAS DEACIDIFICATION PROCESS USING MAGNESIUM NANOMATERIALS

Bliekaitė, K.[1,2*]; Beganskienė, A.[2]; Grabauskaitė, L.[3]

[1] The National Museum of Lithuania, Vilnius, Lithuania, [2] Department of Inorganic Chemistry, Faculty of Chemistry, Vilnius University, Vilnius, Lithuania, [3] Lithuanian Art Museum, P. Gudynas Centre for Restoration, Vilnius, Lithuania

Nanotechnology has found practical applications in the conservation and restoration of the world's cultural heritage. Acid catalyzed depolymerization of cellulose is one of the major problems in canvas conservation, because it causes cellulose degradation processes, which lead to a catastrophic loss of canvas strength. These processes can be stopped or consistently slowed by a deacidification treatment (introduction of alkaline reservoir).

The object of study was to synthesize the nanoparticles of magnesium compounds and to study its application for canvas deacidification process. Nanoparticles, because of its' dimensions, excellently penetrate into the cellulose fibers and fate better introduction of alkaline substances. Nanoparticles of MgO were prepared by sol–gel process using magnesium nitrate hexahydrate and oxalic acid dehydrate as precursors. Magnesium hydroxide nanoparticles were obtained via hydrolysis under nitrogen for 48 hours at room temperature. Suspension of $Mg(OH)_2$ nanoparticles has been prepared using 90 % isopropanol, 10 % water, 2 % MgO. Different molecular mass and concentration polymer additives hydroxypropyl cellulose (Klucel) have been added in accordance with the required amount. The smallest particles of $Mg(OH)_2$ (DLS analysis) were obtained via MgO hydrolysis in isopropanol with 2 % hydroxypropyl cellulose (Klucel E) additive.

The suspensions of 2 % $Mg(OH)_2$ with hydroxypropyl cellulose (Klucel) additive of different molecular mass in isopropanol were prepared and tested for canvas deacidification process efficiency. Absorption and distribution of particles on the textile surface, pH, alkaline reserve of the canvas in differently alkalinized canvas samples were identified and compared. The study data showed, that the prepared suspension of 2 % $Mg(OH)_2$ with 1-2 % Klucel E additive in isopropapol could be used for canvas deacidification process. This suspension created the largest alkaline reserve (1.76–1.50 mol/kg) and optimal pH values (9.63 – 9.57). $Mg(OH)_2$, nanoparticles distributed evenly over the surface of the canvas (SEM/EDS analysis). The results of IR spectroscopic analysis showed successful introduction of an alkaline material which neutralize acidic compounds. These acidic compounds are being formed on oxidation and acid hydrolysis during aging processes of the canvas. This study results allow the use of magnesium nanomaterials for canvas deacidification process.

* Corresponding author: K. Bliekaitė bliekaite.kristina@gmail.com

GENIUS LOCI: TO ENHANCE OUR TERRITORY'S ARCHAEOLOGICAL RESOURCES

Bona, A.[1]; Bozzi, C.[1*]; Radaelli, R.[1]; Tortosa, M.[2]; Valente, R.[3]

[1] Catholic University of Sacred Heart, Milan, Italy, [2] Miasuki, Milan, Italy, [3] Polytechnic University, Milan, Italy

Archaeology belongs to the communities: it defines, enriches and enhances them. From this consideration, our cultural association has planned the creation of a web portal that can offer useful services to the citizens, both professional archaeologists and amateurs, involving them directly in the dissemination of the archaeological resources of the territory in which they live in. Genius Loci wants to be an archaeological website that offers various types of information depending on who uses it.

Our team has also presented the project GL at a competition (L.O.L. Link On Labour, join it on Facebook!) launched by few municipalities of the province of Milan (Italy) and was rated positively: we received a regional funding and we are currently creating this portal, which will have a Google Maps-type of interface. Making the most out of the geo-referencing tool, it will contain different geo information, related to sites or monuments of cultural interest: in particular, it will contain descriptions of the places of interest of a particular territory that can be accessed by anyone, but also didactic files that can be downloaded directly from the website by teachers and that can be used as supplementary educational tools; lastly, bibliographic information relevant to those places, accessible not only to archaeology students, to prepare for their exams, but also by professionals that are more aware of new methods and new searching tools.

The contents of Genius Loci will be modified and implemented in collaboration with the users, to enhance the mutual exchange of knowledge. GL's aim is to involve all the "actors" of the cultural world, exploiting the new technologies to create a renewable and implementable tool, not only thanks to experts but also thanks to everyone who is passionate about archaeology.

The project has just started, in September we will be able to show the firsts results of our work; for the moment it is focused on the north of Italy, in particular we are interested in the Lombardy region, but if we succeed, it can be expanded to the other Italian regions.

* Corresponding author: C. Bozzi chiara.bozzi@rocketmail.com

NANO-CALCITE FOR RESTORATION: SYNTHESIS AND CHARACTERIZATION

Bonacini, I.[1*]; Prati, S.N.[1]; Falini, G.[2]; Sciutto, G.[1]; Mazzeo, R.[1]

[1] University of Bologna, Chemistry Department "G. Ciamician", Microchemistry and Microscopy Art Diagnostic Laboratory, Ravenna, Italy, [2] University of Bologna, Chemistry Department "G. Ciamician", Bologna, Italy

Calcium carbonate has had from earliest times a wide role in art as a pigment (i.e. Saint Jhon's white), as a raw matter in sculptures (i.e. marble as Carrara marble) as well as a substrate for wall paintings. Recently, Calcium Hydroxide nano-particles have been successfully tested for the treatment of wall paintings, stones and paper (Giorgi et al 2010).

This research work deals with the study of a new nano-Calcite product to be used for the consolidation of wall paintings. To this purpose an innovative method of nano-Calcite synthesis have been developed and tested. The nano-Calcite particles are synthesized in alcoholic solutions in order to have a product that evaporate quickly after application without causing further reaction and damages to the heritage substrate. The direct use of nano-Calcite as consolidant, instead of Calcium Hydroxide, presents different advantages: first of all no carbonatation process is required in order to have consolidation, thus the effectiveness of the new product is based on the setting process and on the crystal growth and not on the availability of CO_2; furthermore problems related to the high alkaline pH are avoided. Moreover, the use of the same material constituting the artworks, therefore completely compatible, is a very important issue in the field of cultural heritage.

The particle size and morphology of this new nano-Calcite particles has been characterized by different analytical techniques such as: SEM and AFM. Moreover, a new spectroscopic approach for the characterization of the particle size has been tested and applied by means of FT-IR in MIR and FIR range grinding curves (Addadi et al 2003; Chu et al 2008; Regev et al 2010; Poduska et al 2011). The grinding curves method has been performed with different aims: to investigate the atomic order; to differentiate morphological structure arising from different crystallization process; and mainly to provide a rapid analysis for the measurement of the crystals size. It is the first time that the application of the MIR-FIR grinding curves method has been adopted for the characterization of nano-calcite crystal size.

The new nano-Calcite product has been tested as consolidant on gypsum supports and its performance evaluated by means of optical microscopy, SEM and FT-IR ATR analyses.

Giorgi, R.; Ambrosi, M.; Toccafondi, N.; Baglioni, P.; 2010. Chem. Eur. J., 16, 9374 – 9382.
Addadi, L.; Raz, S.; Weiner, S.; 2003. Advanced Materials, 15, 959-970.
Chu, V.; Regev, L.; Weiner, S.; Boaretto, E.; 2008. Journal of Archaeological Science, 35, 905-911.
Regev, L.; Poduska, K. M.; Addadi, L.; Weiner, S.; Boaretto , E.; 2010. Journal of Archaeological Science, 37, 3022-3029.
Poduska, K. M.; Regev, L.; Boaretto, E.; Addadi, L.; Weiner, S.; Kronik , L.; Curtarolo., S.; 2011. Advanced Materials, 23, 550–554.

* Corresponding author: I. Bonacini irene.bonacini2@unibo.it

BIOPROSPECTING OF ROCK INHABITING FUNGI (RIF's) AT FOUNTAIN OF MARILIA IN OURO PRETO - HUMANITY'S CULTURAL HERITAGE, BRAZIL

Boniek, D.[1]; Santos, A.F.B.[2]; Resende-Stoianoff, M.A.[1,3*]

[1] Programa de Pós-Graduação em Microbiologia, Instituto de Ciências Biológicas, Universidade Federal de Minas Gerais, UFMG, Minas Gerais, Brazil, [2] Faculdade de Engenharia e Arquitetura, Fundação Mineira de Educação e Cultura, FUMEC, Minas Gerais, Brazil, [3] Departamento de Microbiologia, Instituto de Ciências Biológicas, Universidade Federal de Minas Gerais, UFMG, Minas Gerais, Brazil

The Fountain of Marilia, dated from 1759, was built in quartzite by Antonio Moreira Duarte and Miguel de Oliveira. This monument is located in the Largo Marilia de Dirceu in Ouro Preto, Brazil and received this name during the overturning on 19 June 1950. The Fountain of Marilia is considered one of the most important and well composed of Brazil, with considerable dimensions with the main body supported by pilasters with well-developed side volutes. The top is finished by an artistic molding made from an ornate pediment with volutes and garrisoned by four gargoyles, with their fountains and tank with four cavities shaped inverted campanula.

The stone bio deterioration consists of an undesirable change in properties of a material, which is caused by the metabolic activity of an organism involved in transferring chemicals during the biogeochemical cycles. This work aims to identify the filamentous fungi involved in this harmful process on the Fountain of Marilia, and propose measures to minimize its deteriorating effect on historical monuments with the same composition of stone.

For this, samples of quartzite superficial were collected with a sterile swab and then a serial dilution of between 10^{-1} and 10^{-3} in saline solution 0,85%, supplemented with Tween 80 0,001% were plated on Czapek Dox Agar by spread plate method, and incubated for 14 days at 27°C. Fungal colonies were isolated and identified on slide culture through inoculation on Potato Dextrose Agar and visualization with light microscopy. The identification of the fungi was confirmed by sequencing of the region ITS1 and ITS2 by DNA extraction and amplification of the polymerase chain reaction using primers ITS1 and ITS4.

The results showed the correlation between the analysis of cultivation and by molecular analysis, especially with the dominance of some species and genera associated with biodeterioration process, such as *Acremonium* sp. *Alternaria* sp., *Cladosporium cladosporiodes*, *Curvularia lunata*, *Penicillium citrinum*, *Paecilomyces* sp. and *Spondylocladiella botrytiodes*. The dominant three species *C. lunata, P. citrinum* and *C. cladosporiodes* are related to their high abundance observed in the culture in a Petri dish, which ecological parameter reflects the impossibility of other species to develop on the stone surface. In addition, studies indicate that species of *C. lunata* is associated with the production of organic acids – fumaric, malic, citric, oxalic, succinic, that damage the surface of the stones accelerating the biodeterioration process.

Support: CAPES (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior) and MPMG (Ministério Público de Minas Gerais).

* Corresponding author: M.A. Resende Stoianoff maresend@icb.ufmg.br

EFFECT OF GAMMA RADIATION ON THE COMMUNITY OF FILAMENTOUS FUNGI ASSOCIATED WITH ROCKS BIODETERIORATION

Boniek, D.[1]; Mendes, I.C.[2]; Pereira, M.T.[3]; Santos, A.F.B.[4]; Resende-Stoianoff, M.A.[1,5*]

[1] Pós-Graduate Program in Microbiology, Institute of Biological Sciences, Federal University of Minas Gerais, UFMG, Brazil, [2] Department of Chemistry -ICEx, Federal University of Minas Gerais, UFMG, Brazil, [3] Development Center Nuclear Technology-CDTN, Federal University of Minas Gerais, UFMG, Brazil, [4] School of Engineering and Architecture - Mining Foundation for Education and Culture, FUMEC, Minas Gerais, Brazil, [5] Department of Microbiology, Institute of Biological Sciences, Federal University of Minas Gerais, UFMG, Brazil

The biodeterioration process of fungal on rocks can bring negative consequences to the geological matrix by the interaction of chemical, physical and biological factors. To evaluate the feasibility of a treatment by gamma radiation in soapstone collections infected by fungi, experiments were performed to study the variation of mechanical and physicochemical properties as a function of radiation dose.

This study aims to determine the negative and positive effects of gamma radiation on the community of filamentous fungi found in soapstone surfaces of monuments from historical heritage in Minas Gerais,and also assess the possible structural damage that this radiation can cause on the fungal hyphae.

Therefore, two soapstone samples of 5x5 cm^2 were exposed to external ambient conditions for 12 months. Therein superficial samples of the stones were collected with a sterile swab and subjected to serial dilutions between 10^{-1} and 10^{-3} with 0.85% saline solution supplemented with 0,001% Tween 80. The prepared samples were plated on Czapek Dox Agar by spread plate method, and incubated for 14 days at 27°C. Fungal colonies were isolated and identified on slide culture and visualization with light microscopy.

Then, the soapstone samples were exposed to gamma radiation for 97 minutes at rate 6218.8 Gy/h at 10 cm. Afterwards new biological data were collected. Secondary electron (SE) images obtained by scanning electron microscopy (SEM), were used to evaluate the structural composition of the fungal community before and after gamma radiation exposition.

The results showed that the exposition to gamma radiation conditions used in the experiments were effective to exterminate the entire fungal community observed, except the population of black fungi that showed resistance to this type of radiation. With SE images, possible damage to the fungal reproductive structures, could be observed, suggesting that gamma radiation become a likely tool to be used against fungal colonization of the rocks.

Support: CAPES (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior) and MPMG (Ministério Público de Minas Gerais).

* Corresponding author: M. A. Resende Stoianoff maresend@icb.ufmg.br

BORN-DIGITAL ART: DOCUMENTATION MODELS AS A CONSERVATION MEASURE

Boogen Ybarra, A.*

Basque Country University, Bilbao, Spain

This poster develops a review on the valid documentation models for born-digital art conservation. Reviewing the referenced projects, up to the more current documentation models, it is clear that most of them adjust to specific cases in order to meet the isolated needs of the born-digital art. However, models fitted to give general answers have not been found.

This reflexion makes clear the need for updating the documentation models as a means of conservation since all models do not always consider aspects such as soft and hardware obsolescence and the option of unifying documentary and conservation aspects. Because of this and as a counterpoint of the traditional conservation, directed to keep the work or document on its original condition, the born-digital works must be constantly modified and transformed in order to keep being accessible and comprehensible. Here is where documentation plays an essential role. One of the main aspects of the contemporary art is its closeness to life, including society and everyday elements. We live in the "digital era" and art is not on the sidelines, quite the opposite it is deeply influenced by it. The cross between Internet and computers (introduced for user level on the nineties for industrialized countries) and at present the Personal Digital Assistants, (PALM, Smartphone, Tablet etc.) have made possible that, on top of being an art generator tool, we take the artistic outlook towards a digital field.

"Are you born-digital? this will be the key question when it comes to preserve and maintain in the long term the art of our time" (Serexhe et al 2013). This is how Bernhard Serexhe starts his prologue on the last great Symposium publication about digital and born-digital art.

Thus we find new typologies in the contemporary art field:
- Digitalized art (works created analogical which later on have been digitalized)
- Born-digital art (which has a digital existence from the beginning)
- Analogical art (mixed works)

This new art, "born-digital" presents new challenges and problems facing its conservation. The fast cycles of innovation and the short life of the technology deployed are in contradiction with durability. On top of the repairs of obsolete technology implied problem, ads the replacement parts finding difficulty. In both a near and a distant future this situation will get worse.

Serexhe, Bernhard. Vorwort und Dank, en Konservierung digitaler Kunst: Theorie und Praxis: Das Projekt digital art conservation, Bernhard Serexhe (Hrsg).2013, p.13.
Bernhard Serexhe ZKM Museum commissioner of Karlsruhe.

* Corresponding author: A.Boogen ameboogen@gmail.com

THE CONSERVATION PLAN OF GIANCARLO DE CARLO'S UNIVERSITY COLLEGES IN URBINO

Borgarino M.P.*

Politecnico di Milano - ABC Dept. - Architecture, Built Environment and Construction Engineering

The proposed contribution presents the Conservation Plan currently being drafted, of Giancarlo De Carlo's Urbino University Colleges.

The research is funded by the Getty Foundation within the "Keeping it Modern" program 2015 (www.getty.edu/foundation/initiatives/current/keeping_it_modern/grants_awarded_2015.html) .

Aim of the Conservation plan is to develop a comprehensive strategy that takes into account the social and the cultural significance of the complex, which still houses over 1000 students.

The key issues are to define correct methods for the preservation of materials and architectural elements - external surfaces (fairfaced concrete and brick) and the original doors and windows frames, designed by the author, mostly in wood are the main challenges- successfully tackling the issues of maintenance, management and use.

Finally, a management system is developed and implemented in a software specifically designed for built heritage. Issues and hazardous situations are identified, also taking into account the use of the building; predictable damages are envisaged and the areas at risk are identified. A program of interventions, actions and controls is defined and comprehensive instructions are provided, including: urgent maintenance works, monitoring and preventive actions to be performed periodically, improvements and new uses.

The final goal is the development of a "Care Program" providing a "sustainable" balance between conservation (maintaining those elements essential for understanding the building and its values) and changes (new functions, improvements) which are also essential to keep the Collegi's use and social values.

* Corresponding author: M.P. Borgarino paola@borgarino@polimi.it

PROJECT BENČIĆ YOUTH COUNCIL

Bosić, N.*; Golob Mihić, I.

Benčić Youth Council, Museum of Modern and Contemporary Art, Rijeka, Croatia

Benčić Youth Council (BYC) is a project of Art Foundation Musagetes (Canada) and the Museum of Modern and Contemporary Art in Rijeka. The council developed a program that raises children's knowledge and consciousness about the history of their city. Our history is a part of our identity, so by giving them a path to this kind of knowledge we are straightening their sense of belonging, caring for their past, and providing a basis for thinking about the city's future. At the same time we are giving them the means to learn about different kinds of culture, heritage, art, to be involved in the cultural institutions and use their resources, and to assert their input and interest in the cultural fabric of the city.

The project takes its name from and continues the energy generated by Preuzmimo Benčić (Take Back Benčić), an experimental film directed by Canadian artist Althea Thauberger, which was attended by over 50 children from the city of Rijeka. It was filmed in the industrial heritage complex Benčić that is now a central point of the program for the European Capital of Culture 2020 title that Rijeka won.

The Benčić Youth Council is a framework for non-formal education that balances research, work, play, and socializing. It is concerned with the art and cultural education and brings together twenty children who then one weekend a month participate in various group activities. The mission of the Council is to collaborate with and empower children to learn, influence, create, and experience different forms of art and culture in their city.

Our workshops are based on an individual approach, to both research and experience based learning, community service and partner relations. Each month, a new topic is dealt with (artistic expression, current happenings on the cultural scene…) and, in accordance with the topic, a collaboration with various institutions, organizations and professionals specialized in the field of the select topic, is formed. Workshops are held in an authentic setting whenever possible, in order to insure a sensible connection between the children's lives and their social and cultural surroundings.

Here at the Benčić Youth Council we nurrish and develop the freedom to think and act, a sense for creation and initiative, soical and moral values, emotional intelligence, the ability of critical thinking, a sense of indenpendence and active participation in a democratic society.

By presenting our project we want to discover new ways to share our knowledge and methods with other practitioners across Europe and the rest of the world.

http://vijecemladihbencic.com/en/.

* Corresponding author: N. Bosić natali.bosic@gmail.com

THE TECHNIQUE OF ILLUMINATION IN THE TRANSITION FROM MANUSCRIPT TO INCUNABULA IN PARIS: A CASE STUDY

Bottura Scardina, S.[1,2]; Catarina, M.*[2]; Dias, C.[2,3]; Jacobs, W.[2,5]; Ferreira, T.[2,3]; Conde, A.[4]; Cid, I.[4]; Costa, S.[2]; Candeias, A.[2,3]

[1] Università degli Studi di Roma "La Sapienza", Rome, Italy, [2] HERCULES Laboratory, Institute for Advanced Studies and Research, Évora University, Évora, Portugal, [3] Chemistry Department, Escola de Ciências e Tecnologia, Universidade de Évora, Évora, Portugal, [4] CIDEHUS, Évora University, Évora, Portugal. [5] Erasmus Mundus Master: ARCHMAT, Évora, Portugal

Throughout the Middle Ages, the better part of handwritten books were embellished with illuminations inspiring reverence or religious devotion in their readers. With the introduction of the printing press for book production by Gutenberg in 1456, manufacture, trade and decoration became adjustable according to necessities of clients from many social classes, either bourgeois or high class people. Devotional books in particular, because of their theme and nature as commissioned items, showed more resistance to these changes, as their manufacture traced in appearance as much as possible the earlier illumination. Paris, as one of the most important venues in Europe in number of printshops established there, performed an important role in the 15thcentury stage and developed a special trend to illustrated books. Among printers, some specialized in specific production.

The aim of this study was to understand both steps (printing press and illumination) that were followed in the late-15th century Parisian incunabula (one of the first printed book through Gutenberg's technique during the second half of the 15th century) production of *Book of Hours*. For this, the materials and painting techniques present on an incunabulum held by the Biblioteca Pública de Évora (Portugal) were characterized. A selection of some contemporary recipes were reproduced to optimize the analysis of pigments, dyes, binders, fillers, and inks to be detected by spectroscopic analyses (Raman and IR spectroscopy, XRF , FORS). The results partly confirmed the previous tradition revealing, for instance, the presence of pigments used extensively in illumination so far (vermilion , azurite, malachite, etc.).

Figure 1. The Adoration of the Magi Inc. 438 f.11. ©BPE

*Corresponding author: M.Catarina cpm@uevora.pt

ST JOSEPH CHURCH GHENT, A RECONVERSION PROJECT

Bouwen E.*; Perusinovic J.; Van Meerbeek L.

Faculty of Engineering (RLICC), Leuven, Belgium

The Roman Catholic Church always had a great influence on the Flemish landscape, known as the north part of Belgium. Churches, chapels, presbyteries, abbeys and convents are monumental witnesses of a shared, Christian past. Due to the secularisation from the 1960's onwards, the strong bonds with these religious buildings started to fade. Today, only a small amount of the religious heritage is still used for religious purpose. Many buildings are abandoned and gradually lost their original function to gather people in a Christian frame. We are, because of this evolution, at a turning point in history. Communities all over the world are dealing with abandoned or minimally used religious heritage. The re-use of religious buildings is in this sense a challenge we have to meet and there are already numerous initiatives in various countries concerning this reconversion problematic.

As students specialising in heritage conservation, working on the re-use of a church during our final project is a great opportunity. The case study is the neo gothic Saint-Joseph church, located in Ghent. The church will be desacralised in the beginning of 2017, therefore it will become an actual project in the near future. The general aim of the student research is to set-up a reconversion project to preserve and transmit this built heritage to next generations. The research consists of two major parts. The first part includes historical, urban, architectural, economical, legal and technical analysis, which is the basis for the value assessment of the church. Value assessment will be the 'leitmotiv' for the second part of the research, the proposal for the reconversion project. The proposal is a result of community's opinion on five possible scenarios we introduced in cooperation with stakeholders.

The reconversion of the Saint-Joseph church is a challenge for several reasons. The building itself is part of the industrial urban development of the nineteenth century city border. It was purposely placed in the middle of the urban plan as a tool to bind workmen to the neighbourhood and its textile factories. Through time, there were several migration waves, which led to a current multi-cultural mix. On-going urban renewal projects in the area initiated by the city will improve the living quality in the quarter, which are at the same time an opportunity for the future of the church. The fact that the inhabitants of the neighbourhood come from different backgrounds and religions, makes it a clear challenge in terms of re-use. The wish of the owner of the church, the Church Fabric, is that, once again, the church becomes a place where different communities gather together. What will be the new function of the church depends on what the community needs. Questionnaires and interviews will be conducted. Active participation is in this phase crucial – it is the only possible way to propose a feasible project that will serve the whole community and beyond.

* Corresponding author: E. Bouwen evy.bouwen@hotmail.com

GETTING IN SHAPE – A REPRESENTATIVE OF THE KUR-PROJECT

Buchholz, H.; Wentland, E.*; Otto, C.; Guggemos, A.; Hastädt, C.

University for Applied Sciences, Berlin, Germany

Rubber is all around us. Round about since the invention of the Mackintosh raincoat in the 1820's it has become more and more a natural part of our daily lives. Today and in recent history we find it in technical objects as tyres or sealants, it forms part of our everyday use as erasers or chewing gum, most historic medical equipment like stethoscopes and blood pressure meters contain rubber – and then of course it once formed an integral part of fashion: as the bathing cap.

The KUR-project has been launched in 2007 and was executed by the Deutsches Bergbaumuseum Bochum amongst others in cooperation with the degree programme Conservation and Restoration of Modern Materials and Technical Heritage at University of Applied Sciences Berlin.

The project aims to better understand the as yet scarcely dealt with degradation of elastomers and to find appropriate ways on how to preserve cultural heritage made from elastomers. Extensive testing lead the search for conservation materials which can cope with the rubber's unique material characteristics.

The insights gained were then tried on authentic objects. This contribution is based on the conservation of a 1950's bathing cap which has kindly been provided by the Deutsches Historisches Museum in Berlin. It showed characteristic features of decay like discolouration, crazing, brittleness and deformation. The stabilisation of the thin natural rubber and the return to a representable form from flat lain to head shaped were the main aspects of the treatment which has been carried out as part of the course work.

The presentation shall give an understanding of the difficulties coming up when dealing with degraded elastomers and will show a possible way of preservation.

* Corresponding author: E. Wentland eva.wentland@tigernet.de

EVALUATION OF CALCIUM OXALATE CRUSTS AS PROTECTIVE TREATMENT FOR MARBLES USED IN CULTURAL HERITAGE

Burgos-Cara, A.*; Ruiz-Agudo, E.; Rodriguez-Navarro C.

Department of Mineralogy and Petrology, University of Granada, Granada, Spain

Throughout the history, marble has been use as a construction material in many parts of the world. Nowadays, chemical agents from both natural and anthropogenic origins are one of the main decay factors of the construction elements made of marble. This is due to the high susceptibility of the carbonate rocks to chemical attack by atmospheres with high levels of pollution gases such as SO_2 or NO_x which tend to acidify the environment, thus enhancing the mineral dissolution of the marble constituent minerals (calcite and/or dolomite). Carbonates can react with atmospheric aerosols or with saline solutions to form other mineral phases in the surface as well as inside the pore system of the stone substrates, which significantly modifies the physical, chemical and/or mechanical properties of the marble.

This work aims to study the formation mechanism of superficial layers of calcium oxalate on marble as a possible protective treatment against chemical dissolution processes. In order to do this, a multiscale study has been performed using both single calcite (Island Spar, Chihuahua, Mexico) and dolomite crystals (Eugui, Navarra) and real marble cubes (side 2 cm) of two different kinds of marble without any alteration: a calcitic white marble and a yellowish dolomitic marble from Macael (Almería). Both were treated with oxalic acid to form the calcium oxalate crust through a coupled dissolution-precipitation process

After the treatment, the calcium oxalate superficial layer developed in all the samples was analyzed by a range of techniques. It is found that the oxalate layer results in a higher resistance of the marble cubes to acids, without a significant modification of other properties such as visual aspect, hygric o surface mechanical properties.

* Corresponding author: A. Burgos-Cara aburgoscara@ugr.es

GEOGRAPHIC INFORMATION SYSTEMS FOR STUDYING, SYSTEMATIZATION AND ACCOUNTING OF CULTURAL HERITAGE'S OBJECTS OF PERM REGION'S CITIES (ON THE EXAMPLE OF PERM AND USOLIE)

Bushmakina, Y.[1*]; Balyberdina, P.[1]; Dmitrieva, M.[2]; Gogoleva, M.[2]

[1]Perm State Humanitarian Pedagogical University (PSHPU), Perm, Russian, [2]Perm State University (PSU), Perm, Russian

Geographic Information Systems (GIS) are playing an important role in study of Cultural Heritage. Collecting and analyzing cartographic archival materials and their further processing using methods of GIS technologies allow to use historical maps for create digital representations of historical landscapes. With the cooperation of the Department of ancient and medieval history of Russia at PSHPU and Department of cartography and geoinformatics at PSU were created geospatial models that contain information of the architectural heritage of the cities of Perm and Usolie (Perm region).

The result of this research was the creation of the geodatabase with information about the urban planning, development of historical settlements in the XVIII-XIX centuries and the dynamics of cultural landscapes. Geodatabases summarizes information about monuments of history, urban development and architecture of regional and federal importance in the framework of the Unified state register of cultural heritage's objects Russian Federation (the name of the object of cultural heritage, date of creation, a brief historical information, photographic image, etc.).

In addition, the use of GIS technology has allowed visualizing historic urban planning lost as a result of anthropogenic and natural factors that allows using historical data in the development the city-planning regulations and contributes to the conservation and popularization of cultural heritage.

* Corresponding author: Y. Bushmakina yuliyabushmakina@gmail.com

METHODS TO EVALUATE SHELTERS FOR ARCHAEOLOGICAL SITES: REVIEW AND RECOMENDATIONS

Cabello Briones, C.*

School of Geography and the Environment, University of Oxford, United Kingdom

Shelters are commonly considered one of the most effective methods of preventive conservation for excavated archaeological sites. However, archaeological remains covered with shelters are still deteriorating in many cases, and the shelters can even contribute to exacerbating the damage. Therefore, the regular evaluation of the shelter behaviour is extremely important.

This paper presents a summary of the main initiatives on shelter performance assessment carried out to date. In addition, the application of methods used in the field of geomorphology to study heritage conservation has been reviewed. The objective is to determine the suitability of in situ assessments, laboratory analyses and exposure trials for the study of shelters for archaeological sites.

The methodology used to study the effects of the shelters at the Bishop´s Palace (Witney, England) and Hagar Qim (Malta) on limestone conservation is also presented and evaluated. Blocks and tablets were used to document changes in stone's properties periodically at regular intervals for a year. Non-destructive and portable techniques such as ultrasonic pulse velocity and surface hardness have been particularly considered for the study.

To conclude, recommendations based on the case-study sites have been made in order to improve the effectiveness of future approaches.

* Corresponding author: C. Cabello Briones cristina.cabello-briones@ouce.ox.ac.uk

BRICK MASONRY RESPONSE TO WIND-DRIVEN RAIN

Cacciotti, R.*

Institute of Theoretical and Applied Mechanics, Prague, Czech Republic

Moisture constitutes one of the most relevant factors affecting the performance of building envelopes. It is involved in almost every material deterioration mechanism, showing a dramatic impact on the durability of construction materials. The ability of masonry, abundantly found in the existing building stock, to dry and store moisture, as well as its performance in wet conditions are of great importance in assessing its vulnerability to moisture-related damages.

Among all sources of water in buildings, wind-driven rain (WDR) definitely represents one of the most important and has thus been of great concern in building science. The behavior of WDR is complex and governed by the combined effects of the geometry of the building (e.g. height to width ratio), the topography of the environment (e.g. urban or rural settings), wind speed and direction, rainfall intensity and the raindrop-size. In addition, the randomness of the spatial and temporal distribution of the WDR load is a further source of uncertainty which hinders the modeling of rain occurrences.

Understanding and predicting moisture occurrence, ingress and movement within and through the envelope proves to be therefore crucial for obtaining a reliable determination of the response of existing masonry structures to WDR. The research presented here is specifically aimed at assessing the impact of rain on the mechanical characteristics of masonry.

The paper focuses on an experimental set-up for wind tunnel testing of masonry prisms and monitoring of its mechanical performance under compression load during simulated rain events. The main goal is to reveal the contribution of moisture content fluctuations in the redistribution of forces (due to the induced stiffness differentials) within the masonry section under compression and the possible initiation of damaging mechanics, such as cracking at the boundary between the dry and wet areas due to increasing shear stresses. Relevant research problems related to the modeling of WDR, the wind tunnel testing criteria and to the monitoring of moisture distribution within masonry sections are discussed and optimal solutions are proposed.

The research finally provides further insights on the importance of moisture content analysis in the assessment of the material integrity and structural safety of existing masonry constructions, which could be otherwise erroneously determined and over-estimated without taking the moisture effects into consideration.

* Corresponding author: R. Cacciotti cacciotti@itam.cas.cz

REGENERATION PROCESS IN CHINA. URBAN QUALITY AND IDENTITY OF TRADITIONAL ARCHITECTURE

Calia, M.*

University of Basilicata, Matera, Italy

The ministerial agreement of cooperation signed in 2008 by Italian School of Architecture with Chinese Government on issues of Urban Quality, let me to identify some strategic themes of architecture on which I have developed the research started during my Ph.D. courses and which is still is progress. Thanks to different grants and funds, I spent several months working and researching in Guangzhou, capital of Guangdong Province in South China, in cooperation with SCUT (South China University of Technology).

The research on subjects of knowledge for the recovery of memory and identity of architectural features of a place, started with the analysis and survey of portions of a large number of case studies located in Italy and in part of Mediterranean, and was consolidated with depth in southern and eastern China. The theme of recovery of historic centers is the focus of the debate on architecture since several decades in Italy and Europe, and in recent years is spreading in China. When we are called to attend on historical artifacts, we must follow a precise path of investigation and knowledge of them; it needs to start from certain references, as treatys, manuals and codes of practice and find again the capacity for dialogue and collaboration with places, materials and proper tools of the generations that preceded us. Some of the issues of architecture investigated are:

- Forms and ways of living in China;
- Identity and memory of traditional architecture Chinese;
- Recovery, exploitation and architectural regeneration;
- Urban connective: open spaces, empty urban streets, network of streets, alleys, canals, hutong and longdang;
- Western and European influence on residential architecture in Liwan District of Guangzhou.
- Villages in the city in Guangzhou.

Figure 1. View of a part of historic blocks in Guangzhou, surrounding by new buildings

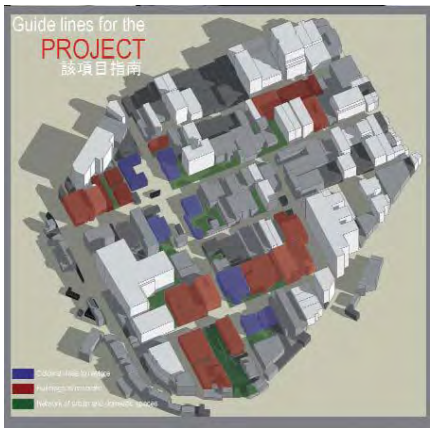


Figure 2. Scheme of regeneration project in a district of the old town of Guangzhou

* Corresponding author: M. Calia marianna.calia@gmail.com

DECAY OF CULTURAL HERITAGE STONES IN UNDERWATER CONDITIONS

Cámara, B.[1*]; Álvarez de Buergo, M.[1]; Bethencourt, M.[2]; Férnandez-Montblanc, T.[2]; La Russa, M.[3]; Ricca, M.[3]; Ascaso, C.[4]; Fort, R.[1]

[1] Geosciences Institute IGEO (CSIC-UCM), Madrid, Spain, [2] Andalusian Center for Marine Science and Technology (CACYTMAR), Cadiz, Spain, [3] University of Calabria, Arcavacata di Rende, Italy, [4] National Museum of Natural History (CSIC), Madrid, Spain

When a stone material changes its exposure conditions (e.g. subaerial, burial, underwater), it has to adapt to the new scenario, transforming itself (starting from its surface which is in direct contact with the environment). This transformation is what the alteration process consists of. Decay implies not only an aesthetic change of the material, but a variation in properties, both surface and bulk ones, and depends on the type of material and the prevailing conditions. In the marine environment, mainly physical (abrasion), chemical (corrosion) and biological (fouling, bioerosion) processes occur. In this context, it is crucial to determine to what extent these underwater decay factors could affect the durability of stone materials, especially when they are part of underwater archaeological remains.

To better understand and going in depth in this subject we have analyzed the change of some petrophysical properties and characterized the deterioration forms generated in two specific stone materials (the Italian Carrara and the Spanish Macael marbles), used worldwide in cultural heritage since Roman times until these days, after being exposed to a submarine environment. For this purpose, specimens of both marbles were submerged in an archaeological site in the Bay of Cadiz (*Bajo del Chapitel*, listed as an area of Cultural Interest) for 18 months, considering three positions in relation to the sea bottom (on the seabed-uncovered, on the seabed-covered, completely exposed to water).

The decay was measured by the change in some petrophysical properties after underwater exposure, such as surface roughness, chromatic parameters and ultrasonic velocity. Furthermore, the interaction between the biological colonization and the stone materials and their associated deteriorations forms were also identified by means of microscopic techniques. Polishing and yellowing of the exposed marble surfaces resulted to be some of the most significant surface changes, altering the original appearance of the material. In addition, on the stone surfaces calcareous deposits attributable to encrusting organisms were abundant in samples completely exposed to the water column. The interior of stone materials revealed, in the first micrometers deep from the stone surface, the presence of trans-crystalline micro-fissures and bioerosion phenomena in the form of micro-borings, which could compromise, in a long-term, the integrity of the heritage stone.

This investigation constitutes an important contribution in the research field of underwater of cultural heritage, since it provides new insights of the deterioration agents and their corresponding alteration forms in stone materials. It will be also useful for designing new protection and *in situ* preservation measures for underwater archaeological sites.

Research funded by Geomaterials 2 (S2013/MIT_2914) Programme.

* Corresponding author: B. Cámara b.camara@igeo.ucm-csic.es

THE DONJONS RESIDENTIEL IN CAMPANIA INLAND (SOUTHERN ITALY): FROM KNOWLEDGE TO CONSERVATION AND ENHANCEMENT

Campi, A. *

Seconda Università degli Studi di Napoli, Dipartimento di Lettere e Filosofia, Santa Maria Capua Vetere, Italy

The research conducted over the past three decades by Prof. Marcello Rotili have focused on the study of medieval fortified settlements of Campania inland. It is the case of castles and settlements of Montella, Rocca San Felice, Monteforte Irpino, Ariano Irpino, Torella dei Lombardi, Sant'Angelo dei Lombardi in the province of Avellino and of Circello and Cerreto Sannita in the province of Benevento. These settlements were affected by heavy restructuring in Norman times, an historical period in which there was not only the implementation of the boundary walls but also the construction of residential towers (the so called *donjons*) which represent an example of a construction model widespread not only in southern Italy, but also in Europe (Sweden, France). The archaeological investigations are followed by restoration work aimed at the conservation and enhancement of the structure of these sites. In the case of Montella, settlement located in the high valley of the Calore river and excavated between 1980 and 2007, the conservation work has led to the understanding of the structures and to the full enhancement of the site. For example, the restoration works of the tower from 2005 to 2008 were very efficient as they led to the accurate reconstruction of the access system and of the wooden floors. The entrance staircase was made of steel availing the anchor holes in the original masonry of the twelfth century, and relevant to the anchor system of the original scale. Also the wooden fourth floor was restored using glued laminated timber beams that were housed in the original holes. The restoration of the original roof, which collapsed throughout the centuries, with a vaulted lowering frame covered with copper foil reproducing the original masonry vault, has finally preserved the historic building.

Figure 1 shows an image of the Montella's donjon, and Figure 2, the particularly of masonry restoration work.

Figure 1. Donjon

Figure 2. Particularly of masonry

* Corresponding author: A. Campi susycampi@alice.it

EXPERIMENTATION FOR WOOD COMPATIBLE PUTTY ARISING FROM RESTORATION OF A GILDED WOODEN STATUE

Caramanna, S.; Megna, B.; Ferotti,S.*

Università di Palermo, Italy

During the restoration work on the Saint Oliva's gilded wooden statue with scenes of her life the main problem faced was the reintegration of a large part of its carved halo. In order to verify the compatibility between available materials and the wood species used for the halo an experimentation was performed using different putties, as proposed by sellers or modified by adding cork powder. The restoration and experimentation work has been carried out during the development of Sarina Ferotti's degree thesis in Conservation and Restoration of the Cultural Heritage at the Università degli Studi di Palermo.

Figure 1. Saint Oliva's statue before the restoration work

The statue is considered of great importance due to two different aspects:

- a cultural one, because Saint Oliva is one of the protagonists of various Sicilian traditions. She was one of the four former Patron Saints of Palermo until 1624, when Saint Rosalia became the absolute Patron of the city;
- a technical executive one, because the statue is entirely gilded according to the Meccatura technique.

The artwork was in a fair state of conservation, but suffers from the metal foil's oxidation that gives to the surface a dark brown aspect, far from the original gold imitation. The statue's halo is separated from it and divided in two parts. Furthermore, there are lacks of fragments and it is deeply damaged by xylophagous insects which infested also the pedestal, even if in a less severe form.

Therefore, the state of conservation directed the study to a non-destructive campaign. Its goals were wooden support's study through Computed Tomography and micro-sampling in order to recognize the present wooden species for preparation coats and metal foil's study.

The intervention then concentrated on artwork's correct legibility restitution and immediately emerged that one of the most complex challenges would regard halo's restoration. Starting from this interesting case, an experimentation was performed to identify the suitable material for wood's plastic restore and for the volumetric integration. In particular we studied wood's mechanical properties and we verified wood's thermohygrometric compatibility with three products: two specifically commercialized pastes and a liquid resin with interesting properties, but not designed for the purpose, tested as it come from the producer and after mixing it with cork powder.

Experimentation's results guided the choice of the most appropriate materials for the restoration work on the halo's missing parts and showed interesting starting points for an in-depth analysis of the proposed composite properties.

Figure 2. The halo before the restoration work

* Corresponding author: S. Ferotti sara.ferotti@libero.it

PRELIMINARY MULTI-SPECTROSCOPIC CHARACTERIZATION OF ACADEMIC NUDE PAINTINGS (LATE 19TH CENTURY AND BEGINNING OF 20TH CENTURY) FROM THE COLLECTION OF FINE ARTS OF LISBON

Cardeira, A.M.[1,2*]; Cardoso, A.M.[2]; Costa, S.[2]; Tavares, C.[1]; Pereira, F.A.B.[1]; Candeias, A.[2,3]

[1]Centro de Investigação e Estudos em Belas Artes, Largo da Academia Nacional de Belas-Artes, Lisboa, Portugal, [2]Laboratório HERCULES e Centro de Química de Évora, Universidade de Évora, Évora, Portugal, [3]Laboratório José de Figueiredo, Direcção Geral do Património Cultural, Lisboa, Portugal

A preliminary study was set around the academic nude paintings of the Collection of the Faculty of Fine Arts of the University of Lisbon (FBAUL). The study of academic nude paintings, from the ends of the 19th century and beginning of the 20th, represents the basis of the painting methodology in the old Academy of Fine Arts of Lisbon and today Faculty. The composition, style, proportion and technical and material characterization of these paintings can allow a deep understanding of the transition from naturalism influences to modernism. The first approach to characterize the academic teaching style of oil on canvas technique in the 19th century in Academy of Fine Arts, 22 nude paintings performed by different students in Lisbon and during their stage in Paris as student border was under study.

High resolution infrared reflectography and X-radiography were performed to uncover underdrawings, identify the pictorial style, execution technique, shades indication and brush marks characteristic of this painter. Furthermore, retouched and restored areas were also identified through ultraviolet-light inspection. Pigments applied by painters were characterized by portable energy dispersive X-ray fluorescence spectrometry and Raman microscopy to provide information about the artists' palette and painting materials used in these artworks. Whenever X-ray fluorescence analysis showed limitations in pigment characterization, Raman microscopy technique was carried out on micro-samples for complementary information.

These painters applied a complex admixture in which some pigments can be identified such as white lead, calcium white; titanium white, zinc white, barium white, yellow ochre, zinc yellow, litharge, umber, vermilion, red ochre, mars red, cooper-based green, ultramarine blue, prussian blue, and a carbon-based black. These results provide valuable information about the palette used by students in Lisbon and the influences that they might have brought from their stage in Paris. This study also intends to provide a record of the French and Portuguese academic painting methodologies and materials applied in the end of 19th century. Figure 1 shows an academic nude painting with visible light, infrared reflectography and X-radiography (detail).

Lisboa, M.H. 2007. Complemento de formação no estrangeiro. As Academias e Escolas de Belas Artes e o ensino artístico, Edições Colibri, Lisboa.

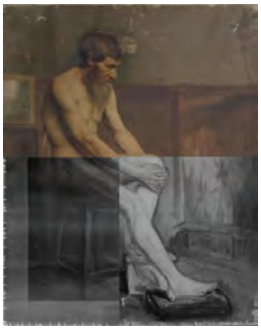


Figure 1. Photograph, infrared reflectography and X-radiography (details) of *Nude male seated, Trindade Chagas (1881-1958), 1902, 81x64,5 cm, oil on canvas, FBAUL*

* Corresponding author: A.M. Cardeira mafaldacardeira@gmail.com

USING WATERCOLOUR MARKERS IN CHROMATIC REINTEGRATION: A CASE STUDY

Cardeira, L.[1*]; Bailão, A.[2]; Baptista Pereira, F.A.[1]; Candeias, A.[3]; Nascimento, S.[4]; Linhares, J.[4]

[1] Faculty of Fine Arts, University of Lisbon (FBAUL), Portugal, [2] Research Center for Science and Technology of the Arts - Portuguese Catholic University, Centre Regional of Porto, CITAR, Portugal, [3] HERCULES Lab and Chemistry Department, Evora University, Portugal, [4] Centre of Physics, Optics and Vision Sciences at Minho University

The aim of this project is to present the preliminary results about the use of watercolour markers in chromatic reintegration. The watercolours markers were tested to ascertain whether these materials are useful for retouching practice.

The study is being conducted within the framework of the conservation and restoration intervention of a painting of the Portuguese painter Adriano de Sousa Lopes (1879-1944), who started his artistic production in the 19th century. The chosen artwork, The Lady with the hat was created by Sousa Lopes while student of Fine Arts in Lisbon (EBAL) and now belongs to the collection of paintings at the Faculty of Fine Arts, University of Lisbon (FBAUL).

Mock-ups with different ground layers were done to compare the behaviour of the markers. These markers have the advantage of having a fine point on one end and a flexible brush nib on the opposite. One of the conclusions is that the fine point enables conservators to achieve more control when performing the distinctive retouching, especially pointillism. Another conclusion is that the ground layers influence the brushstroke of the markers and the saturation of the colours. With both water brush and the flexible brush of the watercolour marker is easy to apply watercolour washes if necessary, but only in non-porous ground layers. The flexible brush also allows uniform underpainting, more saturated in porous ground layer. These markers are a highly pigmented water-based that have permanent ink flow. This characteristic is good for distinctive techniques of retouching but do not allow blending or to create hues gradation when more than one layer is needed.

These conclusions were achieved, first, with examination with the unaided eye during the application of the paint over mock-ups. The deformation of the points and the influence of the fillers were examined at magnifications of 200X. The equipment used consisted of a USB digital microscope Dino-Lite Pro brand - AM4013-FVW model with 1.3 Mpixel resolution. This microscope is portable and is equipped with one switchable LED UV light.

Also, as this is an ongoing project, the paint of the watercolours markers is being tested with hyperspectral imaging techniques.

* Corresponding author: L. Cardeira lili_237@hotmail.com

PLANNING INORGANIC CONSOLIDATION OF PORTUGUESE LIMESTONES WITH PHOSPATE COMPOUNDS. PRELIMINARY TESTING AND RESULTS

Cardoso, I.[1]; Costa, D.[2*]; Mirão, M.[1]

[1] Laboratório HERCULES, Universidade de Évora, Portugal, [2] National Laboratory for Civil Engineering, Lisbon, Portugal

Limestone surfaces of culturally significant architectonic and/or sculptural objects may be affected by granular disaggregation, leading to the eventual loss of the original (artist-created) surface morphology that needs to be preserved.

In the conservation practice, consolidant products are usually applied to restore the mechanical integrity of damaged stone, trying to minimize the erosion of the surfaces.
Organic polymeric and ethyl silicate based consolidants products are frequently used and recommended in conservation practice. However, nowadays, the inadequacy of those products to consolidate carbonates has been recognized due to the limitations of bonding that justify the incompatibility with these litotypes.

Recently, new solutions based in inorganic compounds to form hydroxyapatite (HAP) has been investigated by Naidu et al. (2011) and Sassoni et al. (2011). Besides other advantages, they are more compatible with the carbonate substrates. The results of the research mentioned before allowed us to consider that this solution could be relevant for conservation practice on carbonate stones and justify a new research line in this field. However, in general terms, several issues remain open, such as, their efficacy was not completely proved and their penetration depth has not yet been sufficiently demonstrated which is one of the crucial aspects required in consolidation action.

In order to evaluate this solution, some preliminary tests were performed on two different Portuguese limestones frequently used in Portuguese monuments: micritic limestone, a very homogeneous white limestone, which has a porosity approximately of 22% is almost exclusively composed by calcite (≈95%), with a small percentage of quartz. The samples used for testing were extracted in a quarry in Ançã, Cantanhede region, Portugal. Besides this, an oolitic limestone, less porous (approximately 14%) but very homogenous and white limestone was also selected. It is almost exclusively composed by calcite (>99%) with small grains of silica preferentially spread across the sparry crystals. In this case, the samples were extracted from a quarry in the Estremadura Limestone Massif (Central Portugal).
At this preliminary and exploratory stage, some variables have been taken in account, such as, the HAP precursor, the concentration and the pH of the solutions, the application technique, the washing procedure after treatment and the drying conditions.

Naidu, S.; Sassoni, E. & Scherer, G.W. 2011. New treatment for corrosion-resistant coatings for marble and consolidation of limestone. Conference: Jardins de Pierres – Conservation of stone in Parks, Gardens and Cemeteries, At Paris (F) 22-24 June 2011, 289-294. Paris - France.
Sassoni, E.; Naidu, S. & Scherer, G. W. 2011. The use of hydroxyapatite as a new inorganic consolidant for damaged carbonate stones. Journal of Cultural Heritage, 12, 346-355.

* Corresponding author: D. Costa drcosta@lnec.pt

TRANSMEDIA MANAGEMENT: HOW TO CREATE SMART MODELS FOR THE INTERCONNECTED CULTURAL HERITAGE

Carro Carbajal, C.[1]; González Requeijo, C.[2*]

[1] Independent Researcher, Madrid, Spain, [2] Faculty of Fine Arts (UCM), Madrid, Spain

One of the technical difficulties working on Cultural Heritage is the lack of documentation about the actual state of the building and the "built history" of it. These difficulties affect all levels of asset management, since not limited to the fact of the timely intervention but future restorations and even the management of spaces and continents of artistic goods and the contents thereof.

Another problem, which we usually find, is interferences in communication between different areas converging (technicians, historians, curators, lawyers, public administrations ...) with own languages that make the interrelation be very complicated.

As architects, we focus on heritage buildings that we consider "living entities". This fact makes buildings evolve over time and the different boundary conditions.

These two factors, as well as how we understand the architecture, is what leads us to propose the need to help the building that will be the subject of our intervention to "write his autobiography" to allow analysis and appropriateness of interventions to be performed and generate hypotheses on its possible development.

Our goal is the generation of a smart model capable of unifying the different narrative modes that converge in the study of a building trying to make it understandable to the various agents that can intervene.

To perform this type of documentary models it is necessary work with different levels of information. From the architectural conditions (geometry, associated applications), technical (building, structure, facility) to mandatory (accessibility, fire protection, environment), without forgetting those relative to use (management, users, hygrometric changes), contour (pollution levels). Parameters derived from the continent are also incorporated.

For the generation of this “post-construction data base”, we do not limit ourselves to the realization of a 3D-BIM (Building Information Model), but also incorporate 4D (scheduling), 5D (estimating), 6D (sustainability) 7D (facility management applications).

This presentation is to share our work system in performing smart autobiographical models applied to cultural heritage supporting a transmedia management of buildings and convert users into prosumers (users + producers) able to extend the documentation.

*Corresponding autor: C. González Requeijo carmen@carrogonzalez.es

IDENTIFICATION AND EVALUATION OF MATERIALS USED IN CONSERVATION AND RESTORATION OF ARCHAEOLOGICAL CERAMICS

Carvalho, F.[1*]; Lima, A.[1,2]; Ferreira, J.L.[1,3]

[1] Department of Conservation and Restoration, Faculty of Science and Technology, Universidade NOVA de Lisboa, Caparica, Portugal, [2] Research Unit VICARTE – Glass and Ceramics for the Arts, Faculty of Science and Technology, Universidade NOVA de Lisboa, Caparica, Portugal, [3] LAQV-REQUIMTE, Faculty of Science and Technology, Universidade NOVA de Lisboa, Caparica, Portugal

The most frequent damages on archaeological ceramic objects are breaks and material losses due to physical impact or burial situations. Therefore, it is frequent to find ceramics that have been reconstructed at some point in the past with the purpose to recover their original shape, increase their structural stability or simply for aesthetical reasons. In many instances, the first action of a conservator is to remove those materials applied during former treatments, as they are often aged or were misapplied. However, records on previous treatments are often incomplete or do not exist at all, which difficult the removal procedure. In this context, it is very important to have knowledge on the materials and techniques used over time, in order to understand the chemical and physical properties as well as the ageing behavior of the applied materials.

The aim of this investigation is to make a survey, characterization and evaluation of adhesives and filling materials used in the conservation of archaeological ceramics in Portuguese museums, from the 1970s up to the present. Four institutions were chosen and their treatment records were surveyed in order to establish a chronology of the materials and techniques used over time. Characterization was made both on samples of adhesives and filling materials collected from restored objects belonging to the museums' collections and, when possible, on samples of the conservation materials in their original packages, dated and/or new. Observation under normal and UV light and attenuated total reflectance infrared spectroscopy (FTIR-ATR) were used for characterization. The condition of the restoration materials was evaluated by analyzing the IR spectra and by visual examination.

The survey showed that during the last 45 years epoxy and acrylic resins were the adhesives most used in the conservation of archaeological ceramics, although during the 1970s and 1980s other types of adhesives, as cellulose nitrate, poly(vinyl acetate) or contact adhesives, have been used sporadically. The acrylic adhesives are in better visual condition than the epoxy ones. The types of filling materials used changed less during the same timeframe, being calcium sulfate (dental plaster), polyester and modeling putties the most common filling materials. Also common was the mixing of materials, namely polyester with inorganic fillers or modelling putties. In a general way, the filling materials do not show significant visual alterations with time.

Data deriving from this study will be assembled in a database and made available to the conservation community. It is intended that this information will act as a useful aid to the identification of unknown materials, to the choice of materials and contribute to the study of the history of restoration techniques.

* Corresponding author: F. Carvalho fb.carvalho@campus.fct.unl.pt

TESTING OF NANOSTRUCTURED PRODUCTS FOR THE PROTECTION AND CONSOLIDATION OF STONE SURFACES: THE CASE STUDY OF THE TOWER OF PALAZZO ALLIATA IN PALERMO

Casarino, M.L.[1*]; Fernandez, F.[1]; Alberghina, F.[2]; Gallo, S.[2]; Marrale, M.[2]; Tranchina, L.[3]; Brai, M.[2]; Livreri, P.[4]

[1]Master on Nanotechnology and Nanomaterials for Cultural Heritage, University of Palermo, Italy; [2]Department of Physics and Chemistry, University of Palermo, Palermo (Italy), [3]ATeN Center, University of Palermo, Palermo (Italy); [4]University of Palermo, DEIM, Palermo (Italy)

This study focused on the battlements of the Tower of Palazzo Alliata Pietratagliata in Palermo, which is one of the most important examples of late medieval civil architecture in Sicily. The battlements are made by biocalcarenite and currently affected by a strong desegregation. In order to first characterize the stone some tests have been carried out on small samples collected in situ: chemical and morphological analysis through X-ray diffractometry, scanning electron microscopy (SEM), optical polarized light microscopy (PLM), determination of total soluble salt content by measuring the conductivity and dosage of the anions and determination of the dimensional distribution of the pores.

The second step was the testing of nanostructured products for the consolidation. Indeed, since for this purpose it was not possible to take the necessary amount of samples directly from the tower, the study proceeded on the limestone of Marsala, intended as the lithotype with structural and textural characteristics similar to the one used in the battlements of the tower. On these stone samples other analyses were performed: determination of bulk (MVA) and real (MVR) density through helium picnometer, water open porosity measurement through the method of the hydrostatic balance, x-ray diffractometry, porosimetry through nuclear magnetic resonance (NMR) relaxometry and scanning electron microscopy (SEM). Moreover, after an induced aging of the specimens for simulating the desegregation of the stone, two nanostructured products for the consolidation, both based on nanosilica, have been applied. Then, two more cycles of diagnostics have been performed in order to understand the effect of the products on the stone. The results obtained through these various experimental techniques are reported and extensively discussed.

Figure 1. The tower of Palazzo Alliata Pietratagliata in Palermo

Figure 2. Detail of the stone decay

* Corresponding author: M.L. Casarino arch.casarinomarialucia@gmail.com

TWENTY REVERSE GLASS PAINTING FROM THE SICILY MUSEUM "G. COCCHIARA"

Catanzaro, C.[1*]; Lombardo, E.[2]; Vasi, C.S.[3]; Ponterio, R.C.[3]

[1] Freelance, Rome, Italy, [2] Freelance, Mistretta, Italy, [3] National Research Council, Institute for Chemical-Physical Processes, Messina, Italy

The study carried out on the occasion of restoration of twenty paintings – part of the collection of the *Museum of forestry and pastoral traditions* of Mistretta (Italy) – realized with the reverse glass painting technique (XVII-XX centuries, from various geographic areas), aimed to define and indicate a protocol for interventions and procedures for proper storage and exposition of the artefacts in what currently represents Italy's richest corpus of reverse glass paintings.

Under the coordination of the works, supervisor architect G. Anastasio, it has been possible to lead a thorough analysis on a technical-scientific level using the diagnostics support of the CNR's Institute for Chemical-Physical Processes situated in Messina.

The work consists of the following points:

1) a cognitive study of the technique (processes and materials), with a comparison of information extracted from bibliographic researches and the data emerging from the tests performed,

2) an analysis of degradation events and conservation problems, partially due to the pictorial technique (poor adhesion and / or delamination of the paint film) and partially due to conservative vicissitudes (breakage and damage of the support), making use of the drafting of appropriate conservation report.

3) identifying of operational methods for the restoration, using models recreating different painting techniques, both on laboratory slides and industrial glasses, and proposing degradation conditions similar to those found on the artworks. The tests were carried out to detect the consolidating products and / or adhesion to the paint layers, and to determine the application methods, techniques of adhesion of glass panel fragments, and the distinguishable reintegration to be proposed (based on the size of the lacunae on the artworks).

The creation of a database resulting from information gathered through the examination of such paintings will be the start of a project seeing these information combined with those of other museums; the processing of such information will outline the peculiarities of technical procedures in different geographical areas, and the most suitable conservative procedures for these fragile artefacts (often considered as a "lower form" of artefacts).

* Corresponding author: C. Catanzaro cristina.catanzaro@gmail.com

ACTIONS FOR THE REHABILITATION OF THE HOUSE OF MINISTRIES IN SAN LORENZO DE EL ESCORIAL, MADRID, SPAIN

Chamorro Grande, E.*

Patrimonio Nacional (National Trust), Madrid, Spain

The building of the House of Ministries or Third House of Trades, in the "Lonja" (a wide open courtyard that flanks the north and west side of the monastery, figure 1), at the Monastery of San Lorenzo de El Escorial (Madrid, Spain), is a work of architect Juan de Villanueva, designed in 1785 (figure 2) and built between 1786 and 1804 and declared a national monument in 1931.

The building is structured by the axis of symmetry of its three entrances, ordering inside by three courtyards, one central and two lateral. The center one has a cloistered sense and organizer of circulations that currently is lost due to the incorporation of many of these spaces for housing, which is use to which the building has been allocated in recent years.

With the help of a master plan aims to restore the original appearance of the monument keeping the same three uses: housing, commercial premises and spaces for exclusive use for Patrimonio Nacional (National Trust).

This objective will be accomplished by a comprehensive intervention comprising the envelope (cladding, roofing and carpentry) and ins areas releasing the occupation of public spaces, demolishing partition walls and false ceilings that allow the recovery and restoration of entranceways, vaults, galleries and corridors leading them to a state as near as possible to the original.

Figure 1. Aerial view of the Houses of Trades

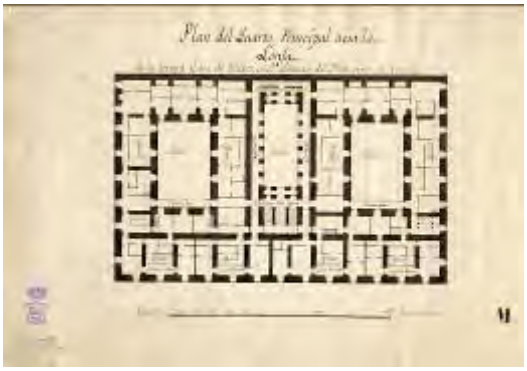


Figure 2. Original plan of Juan de Villanueva

*Corresponding author: E. Chamorro estibaliz.chamorro@patrimonionacional.es

EVALUATION OF MINERALOGY, PETROLOGY AND POROSITY OF LIMESTONE: INFLUENCE OF STRUCTURE ON DURABILITY

Chentout, M.[1*]; Alloul, B.[1]; Belhai, D.[1]; Thomachot-Schneider, C.[2]; Vázquez, P.[2]

[1] Lab. de Géodynamique, Géologie de l'Ingénieur et de Planétologie (LGGIP), Faculté des Sciences de la Terre, de Géographie et de l'Aménagement du Territoire, Alger, Algérie, [2] GEGENAA EA 3795, Université de Reims Champagne – Ardenne, Centre de Recherches en Environnement et Agronomie, 2, Reims, France

Algerian's cultural heritage is built mainly with sedimentary stones, some of them showing a preoccupant degree of weathering. Nevertheless, the lack of petrographic and durability studies of Algerian ornamental stones is an obstacle for their restoration.

In order to contribute to the knowledge of Algerian ornamental stone, three varieties of limestone commonly used in Algerian monument were selected. For this research; a recrystallized travertine characterized by unlocated moldic porosity, a red biomicritic limestone clay-rich and affected by numerous stylolites and a calcarenite with high porosity were selected.

The aim of the present study is to evaluate how the structure of these limestone influences the decay by salt crystallization. The samples (with dimensions 5*5*2) were immersed in a sodium sulfate solution (Na_2-SO_4 10*H_2O, 14%) during 4 hours and dried at room temperature during 20 hours. Mineralogy, petrology and porosity were also determined in order to obtain the potential relationships between these rock properties and their patterns.

The immersion in saline solution highlighted the relationship between structure (crystalline, porous or jointed) of the sedimentary stones and the development of alterations. The damage was more important in the stylolitic limestone and in the porous calcarenite. The visual evaluation of the stone showed deterioration on the faces and edges of the cubes, and also a color change of the saline solution corresponding to the red clay-rich stone. The salt crystallization pressure produced in the stylolites led to the creation of new fractures or by the propagation and extension of the existing ones.

* Corresponding author: M. Chentout mchentout@usthb.dz

FIBERS OF SYNTHETIC ORIGIN. ANALYTICAL APPROACH TO THEIR COMPOSITION

Chércoles Asensio, R.[1*]; San Andrés Moya, M.[1]; López Rey, M.[1]; García Rodriguez, M.A.[2]; Martín Gil, M.[2]

[1] Faculty of Fine Arts, Complutense University of Madrid, (UCM), Spain,
[2] Cultural Heritage Institute of Spain (IPCE)

Costumes and textiles first entered museums as objectsof consumption with ethnographic, historical or documentary values. It was not until the end of 20th centurythat fashion began to have an aesthetic value, achieving the statusof a masterpiece. Nowadays, there are designers who create collections to be exhibited in the galleries of a museum instead of on a runway. In this way, fashion has arrived at the museum, regardless of materials, dating and other kind of information associated with museum objects.Even, in Spain contemporary designers donate to The Costume Museum (Museo del Traje) a costume of every collection, to make the modern collection be increased.

In this context, during the cataloguing process synthetic fibers are not specified as a type of fiber. Fibers of natural origin are easily distinguished with an optical microscope, which allow study of their morphology. However, this morphological study is not enough in the case of synthetic fibers, and different techniques of analysis are required to identify the chemical composition.

Synthetic and semi-synthetic fibers are polymers with specific chemical characteristics. Knowledge of this kind of fiber is essential to a complete study of every garment in a museum collection. In addition, this information is necessary to implement an appropriate preservation plan.

Through this project, a methodology is proposed to obtain the chemical composition of the synthetic and semi-synthetic fibers frequently used in textile industry and in the fashion design. The analytical techniques used have included FTIR-ATR spectroscopy and Py-GC-MS. The results obtained have allowed study not only of the composition of polymeric material but also of the additives incorporated.

Acknowledgements: This search has been supported by the research project HAR2015-68680-P.

* Corresponding author: R. Chércoles rmcherco@ucm.es

ON-SITE IDENTIFICATION OF EOSIN-BASED PIGMENTS BY NON-INVASIVE SPECTROSCOPIC TECHNIQUES

Chieli, A.[1,2]*; Anselmi, C.[1,3]; Romani, A.[1,2,3]; Legrand, S.[4]; Van der Snickt, G.[4]; Janssens, K.[4]; Dooley, K.A.[5,6]; Delaney, K.J.[5,6]; Miliani, C.[1]

[1] Istituto CNR di Scienze e Tecnologie Molecolari (CNR-ISTM), Perugia, Italy, [2]Dipartimento di Chimica, Biologia e Biotecnologie, Università degli Studi di Perugia, Italy, [3] Centro SMAArt, Università degli Studi di Perugia, Italy, [4] Department of Chemistry, University of Antwerp, Universiteitsplein 1, Belgium, [5] Division of Conservation, National Gallery of Art, Washington, [6] Department of Electrical and Computer Engineering, The George Washington University, Washington

In this study, we illustrate a non-invasive multi-modal approach based on elemental, electronic and vibrational spectroscopy and imaging methods for the identification and recognition of eosin-derived pigments. The interest about this class of compounds arises from their use in the form of Geranium Lake, a brilliant pink organic pigment widely employed by Van Gogh and his contemporaries and well known for its deep impermanence to light, according to Greeneltch et al (2012) and Claro et al (2008).

For this purpose, several eosin-based lakes were synthesized following the few historical recipes that are available. These reproductions were utilized by themselves and in mixtures with different pigments to reproduce oil paint models. Both freshly prepared and photochemically aged paint models were analyzed by non-invasive spectroscopic techniques, namely UV-Vis reflectance/fluorescence, X-ray fluorescence and FTIR spectroscopies as well as macroscopic imaging spectroscopy methods (mXRF, hyperspectral reflectance and fluorescence), with the aim of highlighting spectral markers for the identification of this class of compounds also in the case of bleached paints. In addition, extreme dilutions of eosin lake in white pigments (zinc and lead white) were also characterized by the same methods. Overall, the study allowed for the development of a spectro-analytical method which allow for the identification of Geranium lake even in highly diluted or highly degraded paints. Detection results from XRF elemental and VIS fluorescence were compared.

Finally, the results obtained from the model paints are compared with those acquired from historical samples and actual late 19th C. paintings.

This research was supported by the H2020 project IPERIONCH (INFRAIA-2014-2015 Grant No. 654028).

Greeneltch, N.G., Davis A.S., Valley N.A., Casadio F., Schatz G.C., Van Duyne R.P., Shah N.C., 2012, J Phys Chem A, 116, 11863-11869.
Claro A., Melo M.J., Schäfer S., de Melo J.S., Pina F., van den Berg K.J., Burnstock A., 2008, Talanta., 74, 922-929.

* Corresponding author: A. Chieli annipochi2@gmail.com

NANO-DISPERSIONS FOR DEACIDIFICATION OF CELLULOSE IN CANVASES OF EASEL PAINTINGS

Chillè, C.[1*]; Melita, L.N.[2]; Bridarolli, A.[2]; Hackney, S.[3]; Giorgi, R. [4]; Baglioni, P.[4]; Fernandez, F.[5]; Odlyha, M.[6]; Bozec, L.[2]

[1] Painting Conservator, Palermo, Italy, [2] UCL Eastman Dental Institute, University College London, London, UK, [3] Conservation Department, Tate Gallery, Millbank, London, UK, [4] Department of Chemistry and CSGI, University of Florence, Florence, Italy, [5] Master on Nanotechnology and Nanomaterials for Cultural Heritage, University of Palermo, Italy, [6] Department of Biological Sciences, Birkbeck, University of London, London, UK

In recent decades great progress has been made in the application of nanoparticles on the conservation of paper as deacidifying agent and protection against cellulose aging. Several factors (e.g. compounds normally used on ground layer, light, pollutants, pH, temperature, RH, and conservation treatment) may affect the hydrolysis of β-(1,4)-glycosidic bonds of cellulose. This can lead to depolymerisation as well as to a decrease of pH and therefore consequently weakening of the canvases. The aim of this work was to extend a commonly accepted practice, normally used in the conservation of paper, evaluating the application of calcium hydroxide nanoparticles on easel paintings as a deacidification agent. An original 19th Century loose lining, provided by the Tate Conservation Department, has been selected for the study and this extends previous work on deacidification of 19th cent. Loose linings in the NANOFORART project (http://www.nanoforart.eu) (Oriola M. et al., 2011). The linen canvas is sized with rabbit-skin glue and the linseed oil ground is composed by two layers: 1) predominantly chalk with some lead white and 2) predominantly lead white extended with chalk. Alkaline nanoparticles, $Ca(OH)_2$ in propan-2-ol at a concentration of 3 g/L, provided by CSGI (Florence, Italy) (Poggi G. et al., 2014), were applied on the back of the double lining sample by spraying. Samples were left to dry in order to allow the carbonation reaction of the NPs. An additional step took into account the application of consolidants (Plexisol P550 and Beva 371) after the deacidification step. Consolidants were applied on the back of the painting by brush and the samples were subjected to ageing treatment also to evaluate the long-term efficiency of the NPs as alkaline reserve. This step was carried out in order to understand the efficacy of the new deacidification treatment. Scanning electron microscopy (FE SEM) was performed to evaluate the appearance of the fibres before and after treatment in order to assess the distribution of NPs on cellulose fibres. pH measurements verified the neutral pH of the canvas before the application of consolidant materials. In our hypothesis, these NPs provide an important contribution to the development of innovative protocols for the deacidification of cellulose-based artefacts. The deacidification of canvas of easel painting could become a very important step in the inclusion of this new scientific conservative approach in the traditional conservation protocols.

Poggi G., Toccafondi N., Melita L. N., Knowles J. C., Bozec L., Giorgi R., Baglioni P. 2014, Calcium hydroxide nanoparticles for the conservation of cultural heritage: new formulations for the deacidification of cellulose-based artifacts, Appl. Phys. A, Springer.

Oriola M., Campo G., Strlič M., Cséfalvayová L., Odlyha M., Možir A. 2011, Non-destructive condition assessment of painting canvases using near infrared spectroscopy, Proceedings 16th Triennial conference, Lisbon, Portugal, 2011 - ICOM CC.

* Corresponding author: C. Chillè chiara.chille@gmail.com

THE LOSS OF ORAL TRADITIONS AND EXPRESSIONS AMONG INDIGENOUS NATIONS OF FAR EAST RUSSIA THROUGH: CONSEQUENCES FOR COMMUNITY

Chuguevskaia, A.*

Institute for Tourism Studies (IFT), Macao, China

This paper investigates the issues threatening the existence of oral traditions and expressions, a strong element of intangible cultural heritage, of indigenous nations in Russian Federation and discusses the consequences for the associated communities of such threats. Two of the major threats, rapid urbanization and modernization of human life-style, have led to the distancing between generations, a phenomenon clearly evident in native settlements where younger generations are moving to urban areas and abandoning their native culture.

This paper specifically focuses on the case of Evenks people of Russia, who represent one of the largest native minorities of the country. The Evenks were chosen to be a representation of the phenomenon due to the fact that the native community shows high concern for the issue of oral traditions endangerment and works on safeguarding it. The paper used content analysis and netnography research to collect data from social media associated with the Evenks and research articles on the issue to study the factors that affect the loss of oral traditions and the consequences for Evenks people of the loss of their oral heritage.

It was found that topic of the endangerment of oral traditions among Evenks lacks the diversity of research, and does not receive enough support of legal protection of oral traditions and expressions. Nonetheless Evenks people showed great case of community empowerment through the process of creating programs for safeguarding their language and culture in the modern setting.

* Corresponding author: A. Chuguevskaia anastasiiachug@outlook.com

THE EXPOSURE OF CONSERVATION-RESTORATION IN MEDIA: IS THIS A NEW APPROACH TO EDUCATE THE PUBLIC ON CONSERVATION OR JUST FOR SHOW?

Ciliberto, E.*

University of Montreal (UDEM), Montréal, Canada

Nowadays museums are facing new challenges in the exploitation of cultural heritage. Institutions unveil, through more or less spectacular presentations, its inside work and demonstrate how they cater to the care, restoration and preventive conservation of collections. Exhibitions, guided tour in storages and studios, live conservation and restoration interventions are showcased in museums galleries. The behind the scene is revealed with the intention of raising public awareness on heritage preservation. Therefore, the objective of this research was to explore the various ways, which has been tried in European Museum to raise awareness on heritage conservation. We will discuss the value of these practices, its stakes and objectives.

The gathered data come from different sources such as exhibition catalogues and articles as well as from interviews with professionals working in the domain. They will help in analyzing the circumstances within which these events were developed by the experts and professionals and the means employed to present to the visitors the inside work. More specifically the research primarily focused on the study of the following subjects: a) the exhibitions on conservation-restoration methods (*God in Colors,* touring exhibition 2004), b) guided tours in storages (visible and visitable storages of Louvre-Lens), c) live conservation-restoration treatments (*L'atelier du peintre*, G. Courbet Musée d'Orsay, 2015); d) projects activities led in conservation centers (*Archeological site of Ostia Antica*, ICCROM 1997 and *Caught in Time* at Liverpool's Conservation Center, 1996). Projects undertook in museums tend to play on the scientific character of the profession by offering visitors to consult analysis documents such as X-ray, IR, UV etc. Furthermore, ongoing interventions on masterpieces that are showcased in museums galleries, allow visitors to observe and compare work, the «before and after» treatments. On the other hand, it can be argued that the guided tours on museum storages are useful to understand the purposes and the apt usage of those conservation spaces. However, their opening to visitor is keenly debated. Nevertheless, these attempts contrast with projects and activities that are expected to increase public awareness towards the fragility of cultural heritage led by conservation centers.

The result of this research shows that by capitalizing on cultural heritage, it enables to create a outlook that maintains a live and direct link with its users. Yet, some educational initiatives of the above mentioned categories skew the reality and are mostly focused in captivating public's curiosity via methods of entrainment and leisure. Hence to help increase awareness, a solution is to organize the development of specific collective lines, setup information and communication campaigns as well as having communities together with museums staff to actively participate in these programs. The commitment to cultural heritage is only sustainable if it is fully integrated into the overall objectives of an institution. This implies that conservators-restorers must communicate, target several audiences and continually renew the experiences. A powerful and effective strategy plan on cultural heritage, focusing on its accessibility and its conservation, can only add success to the preservation of cultural heritage.

* Corresponding author: E. Ciliberto elena.ciliberto@gmail.com

NOPAL AS ORGANIC ADDITIVE FOR BIO-COMPATIBLE AND ECO-SUSTAINABLE LIME MORTARS

Colantonio, C.[1*]; Persia, F.[1]; Bacchetta, L.[2]; Sprocati, A.[3]; Alisi, C.[4]; Tatì, A.[1]; Falconieri, M.[5]; Insaurralde, M.[6]; Orozco, A.[6]

[1] ENEA, SSPT-USER-SITEC, Rome, Italy, [2] ENEA, SSPT- UTAGRI-INN, Rome, Italy, [3] ENEA, SSPT-PROTER-BIOGEO, Rome, Italy, [4] ENEA, SSPT-PROTER-BIOGEO, Rome, Italy, [5] ENEA, *SSPT-UTAPRAD, Rome, Italy, [6] Colegio de Michoacán (COLMICH), Le Piedad, México*

New sustainable materials research is undoubtedly one of the most important branches which applied sciences are focusing in.

New eco-sustainable products requirement is becoming more solid also in Cultural Heritage restoration and conservation, where both a best preservation of artefact and care of restorer's health are worth considering.

Starting from different studies leading over the use of vegetal origin's organic additives in the preparation of lime mortars in historical buildings such as the numerous applications of *Opuntia ficus-indica* mucilage (known as "*nopal*") found in the prehispanic heritage in Mexico (Kita, *et al*.,2013), in this work the properties of new bio mortars will be tested.

A set of 16 samples using nopal mucilage in different concentrations (2,5%, 5%, 10% and 15%) as organic additive for lime mortars were prepared and different techniques were applied to verify their properties and durability: microbiological analyses to check possible bioattack, spectrophotocolorimetry to control chromatic alteration, water absorption for calculating the relative imbibing capacity, ultrasound measurements to check their integrity and cohesion. The whole diagnostic schedule was repeated after accelerated ageing test for temperature and relative humidity. This paper exposes also an experimental procedure of extraction of nopal mucilage and its chemical characterization (FT-IR analysis, pH and degrees Brix measurements).

Results from characterization analysis show a close similarity between Mexican and Italian *Opuntia ficus-indica* mucilage, confirming the Italian species as a fitting material for the experimental procedure. Ultrasound tests on lime mortar samples added with nopal displayed promising results about a major compactness of the internal structure of samples.

Kita, Y., Daneels, A., Romo de Vivar, A. (2013). Estudio químico para la identificación del aglutinante en muestras arquitectónicas prehispánicas. Seminario Iberoamericano de Arquitectura y Construcción con Tierra (SIACOT) 13, 2013, Valparaíso, Chile, Material Universal, Realidades Locales, Tb: Tecnología e innovación en la construcción con tierra. Valparaíso: Centro de Extensión Duoc y Red Iberoamericana PROTERRA.

*Corresponding author: C. Colantonio colantonio.claudia@gmail.com

REDISCOVERING KUCHI-E WOODBLOCK PRINTS – A RENEWED PERSPECTIVE ON LATE MEIJI JAPANESE PRINTS

Colta, I.P.*

Complexul Muzeal Arad, Romania

The current paper provides a description of an initiative conceived as part of a broader endeavour to rediscover and re-evaluate Japanese prints from the late Meiji period (1868-1912). In May 2016, this initiative has come to fruition in the shape of an exhibition of kuchi-e woodblock prints, organized in Arad, Romania.

The kuchi-e prints exhibited at the Arad Art Museum come from three collections of Japanese art, located in three countries, Germany, Romania and Japan. Most of them are part of the Far East art collection of Adrian Ciceu (Berlin, Germany) and the rest from the collections of Ioan Paul Colta (Arad, Romania) and Ioan-Liviu Orleţchi (Tokyo, Japan).

The exhibition entitled *Kuchi-e. Japanese Prints From the Meiji Period* was the first exhibition of *kuchi-e* prints organized in Romania, and at the same time, the first one in Europe.

The term kuchi-e defines a type of polychromatic Japanese print produced, approximately, in the last two decades of the Meiji period (c. 1890-1912). The word kuchi-e, literally translated as mouth-picture, refers - in a descriptive manner, specific to many Japanese terms - to a woodcut print (or sometimes a lithograph) that was inserted at the beginning (this being the "mouth") of a magazine or a novel. This frontispiece was meant to capture the essence of the story.

Kuchi-e prints enjoyed great popularity at the time, due to their particular charm and, moreover, they had an important role, namely, that of strengthening the bonds of their beholders to the Japanese cultural heritage, to the tradition of Japanese woodblock printing. Thus, the prints benefited in their making from the best craftsmen and engravers especially printers. The most successful examples are on a par, in terms of technical execution, with the luxury edition prints from the Edo period, such as surimono.

The subjects represented in the Kuchi-e prints were very varied, from historical scenes with legendary characters or warriors, to scenes tackling themes inspired from contemporary life and to those depicting beautiful women (Bijin-ga) -- a theme that would establish a new genre and would dominate the production of kuchi-e after 1900.

Kuchi-e prints offer a unique and fascinating insight into the life of the Meiji period and also access to an array of feelings, contexts and imagery, from which modern Japan would emerge in the twentieth century.

*Corresponding author: I.P.Colta colta.restoration@gmail.com

A NEW MULTIDISCIPLINARY APPROACH FOCUSED ON THE CONSERVATION OF "*VILLA DEI PAPIRI*" IN HERCULANEUM ARCHAEOLOGICAL SITE (NAPLES, ITALY)

Comite, V.[1]*; Ricca, M. [1]; Rovella, N. [1]; Ruffolo, S.A. [1]; Urzì, C. [2]; Arcudi, A. [3]; Silvestri, C. [3]; La Russa, M.F. [1]

[1] Department of Biology, Ecology and Earth Sciences (DiBEST), University of Calabria, Arcavacata di Rende (Cs), Italy, [2] Department of Biological and Environmental Sciences, University of Messina, Messina, Italy [3] Conservation Cultural Heritage (C.B.C.), Rome, Italy

Herculaneum ruins and their associated villas, represent one of the most important and best preserved memorials of ancient Roman life. This important town was covered by a series of pyroclastic surges and flows from the famous eruption of Vesuvius in 79 A.D. that destroyed also Pompeii.

Nowadays many buildings of the area are affected commonly by alteration and decay phenomena threatening their stability and conservation. In this regard, the *Villa dei Papiri* is one of the most impressive examples of architecture in Herculaneum and existing before the volcanic eruption of 79 A.D. It was discovered almost by accident in April 1750 during the digging of a well. The stone materials constituting the building show decay phenomena.

This research was focused on the plasters from walls located outside the villa, which show strong biodeterioration phenomena and salt efflorescence. The characterization of the plasters and their degradation phases allowed us to determine the state of conservation of such materials and identify the biological species. The microclimatic parameters of the area were monitored in order to correlate them to the degradation patterns.

Plaster specimens, having similar composition of the original ones, were prepared in laboratory and treated with TiO_2 and Ag based nanoproducts with photocatalytic features, and placed next to the original plasters in a sample holder. The biological activities of the sample surfaces were monitored over time in order to assess the bio-inhibition capability of the nanoproducts in a specific microclimatic condition. Results allowed to evaluate the better concentrations of nanoparticles to be applied on the restoration procedure, in a second stage experimentation.

This research is funded by POR Calabria FESR project "NANOPROTECH" (NANO PROtection TEchnology for Cultural Heritage).

* Corresponding author: V. Comite valeria.comite@gmail.com

TINTYPES: MORPHOLOGICAL AND CHEMICAL CHARACTERIZATION

Costa, L.[1,2*]; Nunes, M.[1]; Miguel, C.[1]; Ferreira, T.[1,3]

[1] Laboratório HERCULES, Évora, Portugal, [2] Erasmus Mundus Master ARCHMAT, Universidade de Évora, Évora, Portugal, [3] Departamento de Química, Universidade de Évora, Évora, Portugal

Photography conservation has been developed relatively recently, in the last 30 years, through studies on the chemical characterisation and historical research of photographic objects.Regarding tintypes, the scientific literature is still scarce. During their period of production, a great variety of materials was used, because the process was evolving very quickly and a lot of materials were being tried to achieve better results. Also, sometimes materials were used besides the ones documented on manuals of the time. These are multilayered items, composed of organic and inorganic compounds and degradation phenomena are strictly related to the composition of the layers; hencethe importanceof the analysis of this kind of objects.

The present work was done on two tintypes. It aims to do an evaluation of their chemical, physical and morphological characteristics and of their degradation patterns. Also, to understand the materials used for their production and cross-check analytical and historical information about the production processes as well as degradation patterns and chemical composition.To do so technical photography,dark field microscopy,scanning electron microscopy coupled with energy dispersive spectroscopy (SEM-EDS), micro-Fourier transform infrared spectroscopy (μ-FT-IR) were used.

* Corresponding author: L. Costa leonorsampaioc@gmail.com

FROM VERNACULAR TO CONTEMPORARY: INVESTIGATION ON THE AESTHETIC OF THE 'UNIT' IN EARTHEN ARCHITECTURE THROUGH TIME

Costi de Castrillo, M.*; Philokyprou, M.; Ioannis, I.

University of Cyprus, Nicosia, Cyprus

Earth has been used in architecture since antiquity, as people traditionally built their dwellings with materials found available in their immediate surroundings. The wide use of earth in architecture throughout the ages can also be verified by the thousands of earthen buildings of World Heritage surviving today. Earth structures have incorporated a variety of building techniques and materials, the dominance of which depended on the different cultural, social, economic and climatic factors of each region. The most common techniques until today are adobe, rammed earth, cob and compressed earth block (CEB) construction.

Adobes were widely used, throughout antiquity and in vernacular architecture, due to the ease of material production and the reduced demand for suitable soils for material preparation. On the other hand, monolithic earth building techniques, such as rammed earth and cob, require much more elaborate soil selection and thus were adopted only in areas with soil that could satisfy specific requirements. The aesthetic appearance of the aforementioned types of earth structures is very different. The use of different type and color soil for the preparation of adobes and the mortar between them that was observed even during the early periods of antiquity, led to an interesting aesthetic result, despite the fact that this was probably not the initial intention. Nevertheless most of the adobe structures were plastered; thus the adobe brick unit was not recognizable apart from the decorative details found i.e. in certain traditions which revealed the scale of the earth 'unit'. In contrast, monolithic earth buildings often remained unplastered and therefore had a very different aesthetic appearance.

Today, the prominent values of earth as a building material are especially attractive in our era of 'sustainable building'. Due to their simple production technology, adobes along with CEBs (which are often considered the modern "relative" of adobe bricks) are considered the best earth-based building materials in this framework. However, the aesthetic of these earth 'units' is often not preferred in contemporary sustainable building, especially when left unplastered, compared to other growingly popular traditional earth building techniques, such as rammed earth, which gain fame due to their aesthetic resemblance to fair-faced concrete. In fact, the study of vernacular architecture shows that no special attention was given to the aesthetic appearance of the adobe structures per se; thus traditionally the selection of the soil used for their preparation was based on availability and suitability and not on aesthetic criteria.

This paper will contribute towards the analysis and understanding of the aesthetic of the 'unit' in earth building (adobe and CEB), through time. The surface aesthetics of adobe brick walls in vernacular buildings will be studied and compared with compressed earth block examples from contemporary architecture. Similarities and differences will be presented, along with new thoughts and concepts on how to work on the aesthetic dimension of the 'unit' in earth building, aiming at introducing this traditional technique as a more attractive alternative in contemporary construction.

* Corresponding author: M. Costi de Castrillo mariacosticastrillo@gmail.com

ARTIFICIAL PATINAS IN CONTEMPORARY WEATHERING STEEL SCULPTURE

Crespo, A.*; Ramírez Barat, B.; Cano, E.

National Center of Metallurgical Research (CENIM), CSIC, Madrid, Spain

Weathering steels were developed in the 20´s and 30´s of the XX century for industrial and structural purposes. Weathering steels were designed as structural material for bridges or buildings because they have good corrosion resistance as well as good tensile strength. They consist of steels with low quantities of Cr, Ni, Cu and Mn as alloys. Under certain conditions, the surface oxidizes, thus creating a patina which provides protection against atmospheric corrosion.

Besides the protective properties of the patina, weathering steels have aesthetic properties as well, due to the appearance of different colors on the oxidized surface, such as brown, orange or even purple, depending on the ambient conditions. So weathering steels began to be used not only as a structural material but also as a material used in works of art, mainly sculptures.

The auto protective patina appears after the wet and dry cycles occur, but getting the rich color takes place over time. That is why some sculptors accelerate the oxidation process of the surface. This acceleration is artificial and does not correspond to the way this material was designed in first place, so it might have an effect on the protective capacity of the material, thus compromising the conservation of the art work in the long run.

Many studies have been carried out on the long term corrosion of weathering steels under different atmospheres and conditions, but they all refer to the natural formation of this patina. However, there are no studies dealing with the process of artificially accelerating creation of these patinas. The main objective of this work is to analyze and evaluate the short and long-term corrosion behavior of certain artificial patinas that have been used by contemporary sculptors.

In the first stage of this project we got in touch with some sculptors, blacksmiths and foundry workers in order to compile their experience. We asked them about the methods and techniques they use to accelerate the oxidation process of weathering steels, the problems encountered when working with this material as well as their personal impressions. Although each one had its own personal way to work with material, we found that basically the compounds used were the same, and were based on nitrates, chlorides, sulfates and hydroxides.

From the information obtained during these interviews we selected six artificial patinas to reproduce in the laboratory what sculptors do in their studios. These samples will be exposed to the atmosphere so that we can compare the corrosion caused by artificial patinas with that produced by natural ones. In this way we can determine the effects that the accelerated corrosion can have on the properties of weathering steels.

* Corresponding author: A. Crespo a.crespoibanez@cenim.csic.es

PRELIMINARY ASSESSMENT OF INNOVATIVE CLEANING METHODS COMBINING LASER, CHEMICAL AND BIOLOGICAL MEANS ON HYGROSCOPIC SURFACES OF A WOOD PAINTING: LIMITS AND POTENTIALITIES

Crisci, L.[1*]; Santamaria, U.[2]; Alisi, C.[3]; Sprocati, A.R.[3]; Pustka, M.L.[2]; Breda A.[2]; Pratelli, M.[2]

[1] Restorer Freelance, Rome, Italy, [2] Vatican Museums, Città del Vaticano, [3] Biogeochemistry Laboratory ENEA-Casaccia, Rome, Italy

This presentation reports the results of some cleaning trial runs, carried out on an oil-tempera painting on wood representing a “Madonna della cintola”, dated around the beginning of the sixteenth century. The research was carried out within the framework of a collaboration between the Vatican Museum’s “Scientific Research and Paintings Restoration” laboratory and the ENEA-Casaccia, Biogeochemistry laboratory. The problem addressed was the removal of tenacious heterogeneous substances adhering to the pictorial surface. The main limitation was the thin, highly deteriorated surface, sensitive to the contact with both aqueous solutions and solvents used during preliminary assays. The heterogeneous substances had been applied on different parts of the paint during an earlier intervention, probably dating back to the late nineteenth century. Animal glue mixed with oil was found on the upper area of the sky; a mastic resin on the figures of the characters; an oily mixture with traces of lead on Azurite and Malachite with copper. Due to the difficulty faced by the restorers of removing these substances without risking further damage to the artwork, innovative applications of different methods were tested and compared: i) the combined use of Cyclododecane as temporary consolidant to help withstand the wet pack containing bacteria (biocleaning); ii) chemical cleaning; iii) Er:YAG laser. The results will be critically discussed as well as the potential and the limitations of the single or combined techniques already emerged while at work. This is the first time ever that the use of bacterial cells for biocleaning of hygroscopic surfaces is reported.

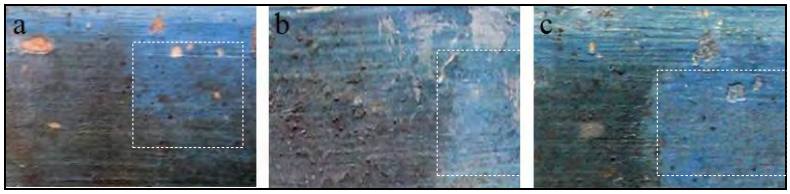


Fig. 1 Comparison between biocleaning after a) 8 h and b) 24 h; and c) chemical cleaning

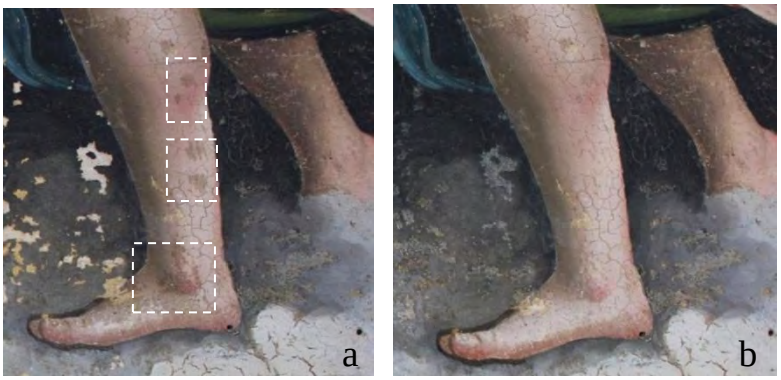


Fig. 2 *Treatment with Er:YAG laser: a) before and b) after the cleaning*

*Corresponding author: L. Crisci luci.crisci@gmail.com

SYNTHESIS AND ANALYSIS OF VERDIGRIS PIGMENT BY THREE MODERN TECHNIQUES OF THE XIX AND XX CENTURIES

Cruz Núñez, M.E.[1,2*]; San Andrés, M.[2]; Chércoles, R. [2]; de la Roja, J.M.[2]; Sancho, N.[2]; Mazzo, R.[1]

[1] University of Bologna, Ravenna, Italy, [2] Faculty of Fine Arts. Painting Restoration, University Complutense of Madrid, Madrid, Spain

Verdigris is a copper acetate salt that has been one of the most important historical synthetic pigments used on easel paintings mainly during the 15th to the 17th centuries in Europe. In that time, it was used as an ingredient for the production of green-bluish tones and nowadays is used as an intermediate in the manufacture of Paris green, as a textile dye, as a pigment for ceramics, and as a catalyst.

San Andrés's work team performed an exhausted historical review of verdigris recipes and its corresponding analytical information, concluding that is important to establish identification patterns for all the different variations of verdigris that are known, trying to avoid in this way possible inaccuracies in the interpretation of new and already known verdigris pigments. It is also easy to see in the obtained information, that the recipes before the 19th century are the most studied ones even there were new processes patented after the Industrial Revolution.

Due to all of the above, this work has two central targets, the first one is to test the feasibility of the synthetic processes developed during the 19th and the 20th centuries, particularly three of them. These are: a patent registered by Ludwing Brumlen in 1857 with the name *Improvement in processes for manufacturing verdigris*, another patent created by Georg Schneider in 1911 called *Process of producing verdigris*, and the one *modern chemical process* written by J. Gauld Bearn in his book *The Chemistry of Paints, Pigments and Varnishes* in 1923. The second objective is to characterize the morphology, crystallinity, and chemical composition of the products by different analytical techniques, such as Optical Microscopy, SEM, FTIR, and XRD in order to contribute to the increase of the spectra database of this important pigment i.e. verdigris.

Finally, as a secondary purpose, the time consuming process, the yield of the reaction and the quality (resistance to aging) of the obtained pigments will be compared between the craft recipes and the new industrial production pathways.

This research has been supported by Geomateriales 2 (S2013/MIT-2914) CAM and Fondos Estructurales (FSE y FEDER). Grant program CONACYT (Mexico Ref. 333318) and Fondazione Flaminia Scholarship of University of Bolonia awarded to Ma. Elena Cruz Núñez which have supported her internship in the UCM.

* Corresponding author: M.E. Cruz Núñez mariaelena.cruznunez@studio.unibo.it

THE IMPORTANCE OF INDUSTRIAL HERITAGE: THE CASE OF CERAMICA LIGURE VACCARI

Cutullè, A.*

Università degli Studi di Padova, Padua, Italy

When we talk about cultural heritage we consider some kind of cultural assests, such as enviromental heritage, paintings, artworks etc. Often we forget to remind that the industrial heritage is a part of our heritage in general. In fact there is a learning about this topic: the industrial archaeology, which deals with the history, the protection and the preservation of the industrial heritage. Why is it so important? Because our past is closely linked with the history of its manifacturing and economic growth.

To better understand what I'm talking about I need to take an exemplary case of industrial heritage: the Ceramica Ligure Vaccari in Santo Stefano di Magra (La Spezia, Italy).

I studied this case during my master's thesis, because is a rare case of preservation of warehouses and a workers' village of the early twentieth century. For this reason I reconstruct the history of the factory, which produced cladding tiles, and also the history of the village that was built by the owner of the factory, Carlo Vaccari, who understood the importance of giving a home to the workers who came from other cities.

Each building was constructed with a different function: the dining hall, the factory outlet, the showers, the bicycles' storage, the Church, the block of the leadership, the Villa of the owner. In this factory also we must not forget that important futurist artists, like as Enrico Prampolini and Fillia, were involved to create some mosaics with the Vaccari's tiles.

All these buildings create a real community, a small town with a specific role in the country. When the factory closed in 2006, the history was forgotten and the most part of the buildings was abandoned.

Now there is a project of reuse of this area, called ProgettoNOVA, where some cultural "workers" managing the spaces.

This is the aim of the industrial heritage, not to be forgotten, but to be experienced again.

* Corresponding author: A. Cutullè alice.cutulle@gmail.com

THE RESTORATION OF THE INDUSTRIAL HERITAGE OF THE TOWN TO CREATE NEW SOCIAL CENTERS

De Felice, R.*

Department of Architecture and Industrial Design "Luigi Vanvitelli", Seconda Università degli Studi di Napoli, Aversa, Italy

Today our cities are to deal with a dense built fabric and at the same time with a constellation of empty inside, often buildings or open spaces, forgotten or underutilized. Make them usable again, restoring them and giving him again a sense within the society, is an action to focus attention on the question of the future of these spaces, wondering about what opportunities they can offer. Often it decides to revive the urban fabric from a particular building, whether it be of historical importance or simply representative of an industrial past of the city. At the base there is the concept of resilience since in this way the historical artifact is projected in reality, also being, in this case, in the presence of a no-funtional space. Attempts to produce exchange places and relationships in the contemporary city have led to the creation of non-places, the spaces without identity, relationships, history. In urban areas the gap is diversified, open collective, it produces movement and variation. The opportunity to develop our cities could be given by the "urban voids" that can be read as a multi-functional public spaces as places of aggregation and growth of social life. The fragments of the city, *les oubliés*, become active materials of the urban project and the distances that separate them generically, of possible new tools for the project. With the uncontrolled expansion of the city devouring ever larger portions of the territory, with the wild zoning that isolates some buildings of the post-industrial cities, such as slaughterhouses, old garages or old urban factories, the distance becomes only a free space, undeveloped, which generally separate elements, parts, fragments scattered in the urban area, between which it becomes necessary to establish a new principle of rationality. This principle can be restored precisely through the forgotten spaces, the service sector, too often associated only with non-active environments, the a-sociality. The concept of restoration should not be associated only with the magnificence of the monument seen as a given time, it should also be used to capture fragments of urban land has always been related to the normal course of city activities. "The aqueduct lives when they stopped bringing water.(…) I coined the aphorism in contrast to another aphorism: form equal to function. Well, the aqueduct was built to bring water, but you have to ask yourself a question: why, when certain structures lose their function, man doesn't destroy them? Occurred for aqueducts, bridges, other buildings... It means that within certain structures there is something which man needs, even if they no longer serve the purpose for which they were created. At a time when the aqueduct ceased to carry water, the only thing that still lives in him is the architecture. So it's only through non-function you can best discover the true quality of architecture". Some spaces may also be only temporarily accessible. The temporary structures by definition are not defined and stable works but just these characteristics make them editable and adaptable to the needs of citizens. Could be the device to wake places, strengthening the relationship between people and trigger changes in the territory, whether it be of architectural artifacts that open space. Once the period originally defined finished, it opens up different perspectives: the experience can be defined over, considering the possibility of continuing, renewing for a further limited time or permanently losing its character of temporary nature, becoming an integral part of the city.

Snozzi, L.,5 July 2011. L'architettura deve fare resistenza contro la società. La Sicilia, 21.

*Corresponding author: R. De Felice rosalbade@hotmail.com

SEE THE MUSEUM. A PROPOSAL FOR NEW TECHNOLOGY APPLICATION IN THE FUTURE VIRTUAL MUSEUM OF FINE ARTS FACULTY OF THE UNIVERSITY OF SEVILLE (SPAIN)

De La Cueva Caballero, M.L.*

Faculty of Fine Arts, University of Seville, Seville, Spain

Throughout History, the University of Seville has accumulated a valuable collection of works of art of monumental and artistic character. About this group has been carried out several studies, most of them focused on the dissemination and cataloging of the collections of the University of Seville, with the main aims, educate, enhance and preserve.

This heritage is distributed in various university institutions of the city, including the Museum of Education, highlighted by the recreation of a Franco classroom, which contains books, objects and feelings of the time. Also the History Museum of Pharmacy, with the collection and storage of medicines, books and pictures of pharmacies, and finally the Geology Museum with the exhibition of minerals, rocks, fossils among others, being highlighted as center of research and training.

Instead the Faculty of Fine Arts in Seville, due to management problems has been unable to carry out the musealization of its pieces, highlighting collections of emptied, collection of academic drawings, etc.. That is why we conduct a musealization, organized by types of cultural property. To do this we will help us the use of new technologies, creating a virtual museum, which will allow us access to each of the pieces.

To do this, we have helped 3D programs highlighting the 3D Autocad, with the recreation of the image by lifting the floor. As the Skeptshup program which has provided us with different textures, light and shadow recreating a realistic environment as possible. And finally the Tradky navigation program enabling us inside the rooms that make up the course Virtual Museum of Fine Arts.

Prior to the final realization in 3D have consulted various virtual museums across the network, with reference to the Virtual Museum Costume Museum, Safardí Museum Toledo, Casas Cervantes Valladolid Museum, Museum of Ceramics and Santuarias Arts in Valencia between others. As we investigated about the steps in the realization and operation of these museums virtually, advantages and disadvantages, in addition to its effectiveness.

Figure 1. Design made in 3D virtual museum of the Faculty of Fine Arts

The virtual museum is a large warehouse where data and images are collected, to facilitate the viewer a closer way to the artworks. This idea has been carried out in order to provide a beneficial basis for the conservationist world, the incorporation of new technologies being these useful for the maintenance and control of works of art besides of being considered an interesting means of diffusion and information.

*Corresponding author: M.L. De la Cueva Caballero mawi_dcc@hotmail.com

CULTURAL LANDSCAPE RISK IDENTIFICATION, MANAGEMENT AND ASSESSMENT (CLIMA)

Di Iorio, A.*

Alma Sistemi, Guidonia Montecelio, Roma, Italy

Nowadays Europe's Cultural Heritage (CH) is at risk, endangered by environmental processes and anthropogenic pressures. Physical and chemical destruction and degradation of structures and artefacts amplify the natural deterioration and reduce the ability of the soil to preserve CH. In addition to physical damages, the intensive agriculture activities and the effects of climate changes are responsible of the increase of soil erosion affecting structure stability and producing significant negative consequences on the conservation of the archaeological artefacts. In this scenario, authorities in charge to CH preservation have a strong requirement for systematic, effective, usable and affordable tools and services to monitor the degradation process to enable preventive maintenance and to reduce the cost of the restoration.

The broad spectra of Satellite Earth Observations (EO) provide the ideal platform to undertake a wide range of effective, cost-efficient and up-to-date programmable analysis, as a support to traditional tools.

The project CLIMA (Cultural Landscape risk Identification, Management and Assessment), funded under the Joint Program Initiative- Cultural Heritage programme, addresses the design and development of a multi-task platform, combining advanced remote sensing technologies with GIS application for mapping and long term monitoring of archaeological CH in order to identify changes due to climate changes and anthropic pressures.

The CLIMA project is characterized by the use of innovative integration of data processing chains using different EO methods (optical, multispectral and SAR) with ground-based remote sensing data, both traditional (magnetometry, GPR etc.) and newly developed (gamma spectrometry). The EO processing chain will address the major soil-oriented risks affecting CH: soil erosion, structural stability and vegetation as well as risks due to anthropic pressure. Analysis and definition of ground-based remote sensing methods for mapping and monitoring of buried and exposed archaeological structures has been carried out.

The CLIMA Platform will enable the authorities responsible for the preservation of the archaeological cultural landscape to carry out an effective planning and implementation policy of preventive maintenance. The project CLIMA is leaded by University of "La Tuscia", Italy and includes ALMA Sistemi sas, Italy and partners from Cyprus, United Kingdom and Denmark.

Agapiou, A.; Lysandrou, V.; Alexakis, D.D; Themistocleous, K; Cuca B; Argyriou, A.; Sarris, A.; Hadjimitsis, D.G. (2015): Cultural heritage management and monitoring using remote sensing data and GIS: The case study of Paphos area, Cyprus. Computers, Environment and Urban Systems, 54, 230–239.

* Corresponding author: A. Di Iorio adi@alma-sistemi.com

FROM EXCAVATIONS TO CONSERVATION: EVIDENCE FROM THE LATIN COLONY OF NORBA (LAZIO, ITALY)

Di Niola, M.*

Dipartimento di Lettere e Beni culturali, Seconda Università degli Studi di Napoli, Santa Maria Capua Vetere, Italy

The ancient city of Norba is situated in the Lazio region, approximately 500 m above sea level on a plain in the Lepine Mountains in the dominion of the Pontine Plain.

It was already mentioned by the historian Titus Livius in the 5th century B.C., when a colony was sent there "*quae arx in Pomptino esset"*, the life of the city did not last long: Norba, during the Sulla wars, after having taken sides with Mario, was taken by enemy troops and its inhabitants preferred to commit suicide and to set fire to the city rather than surrender.

This took place in 81 B.C. and the city has remained petrified since then, frozen in its urban structure without any subsequent stratifications and for this very reason, scholars consider it is so unique and extraordinary.

Norba was studied at the beginning of the 20th century, from 2005 to today, excavation activities have been carried out on this site by a team of researchers from the Seconda Università degli Studi di Napoli, which has brought to light twelve houses as well as a few streets.

The contribution made here focuses on the interventions and the techniques implemented to conserve the excavated structures: in Norba, not having adopted the roofing system, we had to deal mainly with the problem of the conservation of the floors and the walls as well as the inclusion of the areas visited by tourists.

The floors in the houses were renovated and subsequently covered with volcanic red stone chippings in the closed rooms while the open areas were covered with pink Carrara marble, so that they could be protected from the weather and, at the same time, they could illustrate the planimetry of the house.

The walls consisting of a stone plinth with a stone upright support were strengthened with Scots pine poles while, wooden formwork was installed where there were "earthen walls" which gave the idea of the encumbrance of the walls and, where there were no doors, open gates were created so as not to hinder the view.

The same choices were made also for the streets, the misplaced stone blocks were re-positioned and those which were missing have been filled in with white grave.

*Corresponding author: M. Di Niola margherita.diniola@libero.it

GAMES ARE IN THE AIR: THE CONSIDERATION OF VIDEOGAMES AS CULTURAL HERITAGE AND THE MUSEALIZATION THEREOF

Díaz González, L.M.*

Master of Museums and Historical and Artistic Heritage Advanced Studies, Universidad Complutense de Madrid (UCM), Madrid, Spain

This study analyses the possibilities of videogames as key to the development of an aware and critical 21st century society; moreover, as a mainspring of cultural diversity and a tool to promote sustainable development, we must consider videogames as invaluable world cultural heritage.

Our research synthesises different studies in the medical application of videogames, in terms of their use as educational tools as well as in the dissemination of culture. As such we regard videogames as cultural heritage.

Furthermore, this survey has observed the evolution of videogames and their associated materials: machines, merchandise, international companies and their relationship with the development of new technologies (virtual reality, 3D, etc).

Given these views, the study adopts a systematic approach towards defining the situation of videogames in museums around the world. It also reviews those national conventions, awards, studies and symposiums which address videogames and their appropriation and integration in cultural spaces (museums, artists, universities, among others).

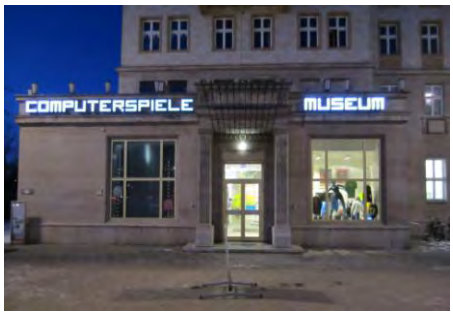


Figure 1. Computerspiele Museum, Berlín

Figure 2. Nintendo Museum, Osaka. Source: blog.beforemario

Figure 3. Smithsonian American Art Museum, Washington D. C. Source: www.wired.com

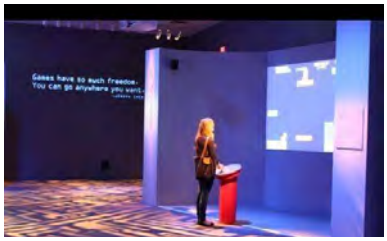


Figure 4. The Art of Videogames, exhibition of Smithsonian American Art Museum, Washington D. C. Source: pinterest.com

* Corresponding author: Lucía M. Díaz González luciamariadg@gmail.com

RESTORATION OF ARCHAEOLOGICAL ARTEFACTS AND NON FORMAL EDUCATION IN CULTURAL AND HISTORICAL HERITAGE WITH THE DEATH CAMP KULMNHOF MUSEUM AND SERVICE CIVIL INTERNATIONAL. THE AIMS OF NO MORE WAR PROJECT IN CHELMNO AT NER, POLAND

Dluska, M.*

One World Association, Poznan, Poland

Service Civil International is a nongovernmental organisation which has been actively participating in volunteering worldwide since 1927. The idea of the organisation was to prevent the violence and inhumanity of I and II World War from happening again. In 2015 the polish branch of organisation (OWA) started to collaborate with Jewish Holocaust Museum in old Kulmnhof Death Camp in Chelmno at Ner in Poland as a part of NO MORE WAR Project. International volunteers from many countries came to participate in the project. Group of 10 people of different backgrounds and age was highly interested in the topic. The volunteer camp had two aims: education about the World War II based on the history of Kulmnhof and restoration of its collection as well as integration and propagation of intercultural tolerance.

In the first place volunteers were taking care of more than 2000 artefacts, personal belongings of the holocaust's victims. Under the supervision of archaeologist and conservator they helped in primary restoration works and preservation of the collection. Additionally some of the participants were working on cataloguing the objects. During the second part the activities pertained to integration of intercultural society. At that time many workshops and trainings concerning maintaining the peace in the world, opposing violence and promoting intercultural tolerance had been held. This work camp was a great sample of the way how to use non formal teaching methods for cultural and historical heritage education. Moreover it shows how different social groups are perceiving and understanding the holocaust and it's aftermath.

* Corresponding author: M. Dluska art.monika.dluska@gmail.com

GESTURE BASED INTERFACE FOR PRESENTATION OF SCIENTIFIC ANALYSES OF HISTORICAL VIOLINS

Dondi, P. [1]; Lombardi, L. [2]; Malagodi, M.[1,3*]; Licchelli, M. [4]

[1] University of Pavia, Arvedi Laboratory of Non-Invasive Diagnostics, Cremona, Italy, [2] University of Pavia, Department of Electrical, Computer and Biomedical Engineering, Pavia, Italy, [3] University of Pavia, Department of Musicology and Cultural Heritage, Cremona, Italy, [4] University of Pavia, Department of Chemistry, Pavia, Italy

Scientific analyses performed on cultural heritage artifacts involve the use of complex techniques, generally difficult to understand for not expert people. In the last years many museums introduced new types of interactive installations that present cultural and scientific data in a easily way (Mortara et al., 2014). Gesture based interfaces are commonly adopted for this purpose, since they are very attractive, in particular for young people. Microsoft Kinect is surely one of the most used sensors in this field. In fact, exhibition itineraries in the museums are generally not interactive and the visitors have a passive role during the visiting. The aim of this work is to increase the cultural heritage education by the use of this system as an interactive game. In this paper we describe an innovative system based gesture tool, designed to easily disseminate scientific data and results obtained by the analysis of historical violins preserved in "Museo del Violino" in Cremona (Italy). The interactive Kinect will increase the technology of the itinerary, if compared to the multimedia touch screens and videos already present in the museum. The graphical interface is kept simple to be intuitive both for adults and kids (Fig. 1). The application deals with different types of information. It allows to shows a rotating violin generated by a series of high resolution images acquired at different points of view; the user can control the rotation and the zoom simulating a sort of 3D navigation of the instrument. At the same time, at any level of zoom, it is possible switching between visible light and UV induced fluorescence visualization, a simple way to note the difference between the two types of illuminations. Moreover, it is also possible to click on active areas defined on the images to present further information, such as microscopic enhancement, RX photos, or chemical analyses performed in that region. We are currently testing the application with the goal to use it in the Museum as part of the main exhibition or of educational tours for schools.

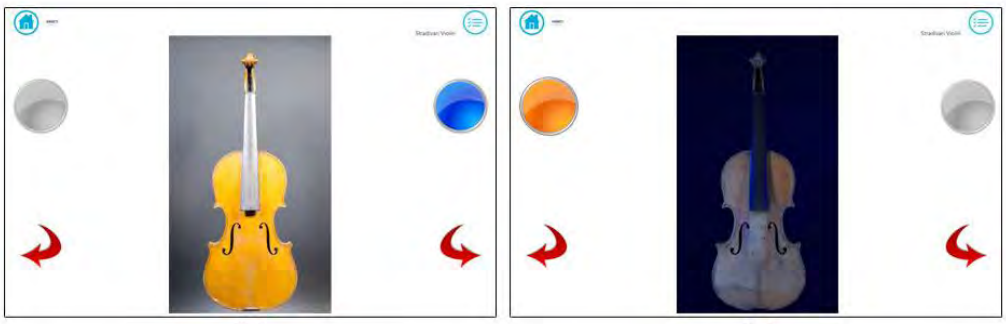


Figure 1. Graphical interface of the program: (a) visualization of an image of a violin in visible light; (b) the correspondent UV induced fluorescence image. All the interactions are gestural based

Mortara,M; Catalano,CE; Bellotti,F:; Fiucci,G; Houry-Panchetti,M; Petridis,P. 2014 Learning cultural heritage by serious games, Journal of Cultural Heritage, 15, 3, 318-325.

* Corresponding author: M. Malagodi marco.malagodi@unipv.it

REVIEW OF NON DESTRUCTIVE TESTING WITH INFRARED THERMOGRAPHY IN CULTURAL HERITAGE: FROM INDOOR TO OUTDOOR PRACTICES

Dumoulin J.[1,2*]

[1] LUNAM Université, IFSTTAR, COSYS-SII, Bouguenais, France, [2] INRIA/IRISA, Team I4S, Campus of Beaulieu, Rennes, France

Infrared thermography for Non Destructive Testing (NDT) has encountered a wide spreading this last two decades, in particular thanks to emergence on the market of low cost uncooled infrared camera with or without autonomous powered capabilities. So, infrared thermography is no more a measurement technique limited to laboratory application. Its application in cultural heritage survey, but also in many other domains, is denoted by the increase of papers in the literature.

Nevertheless, laboratory measurements are done as much as possible in quite ideal conditions (good atmosphere conditions, known properties of materials, homogeneous surface etc.), while measurements on real site require to consider the influence of not controlled environmental parameters and additional unknown thermophysical and thermoradiative properties. So, dedicated protocols and sometimes additional sensors are required for measurement data correction.

We will first remind some typical thermal physical indicator and infrared system main characteristics to be considered before launching experimental investigation on real site. Then we will address the most current monitoring practice used in Cultural Heritage to monitor and/or retrieve information on object surveyed. The use of natural or artificial thermal excitation will be presented and discussed for painted surface versus unpainted surface (thin to thick). The nature, form and duration of the thermal excitation used to retrieve information has to be connected with the choice of more or less adapted post-processing tools. Finally, preservation of the integrity while using such technique will be evocated.

Conclusion on infrared current practice will be proposed for cultural heritage applications. Perspectives will be given in particular by addressing the coupling of infrared with other NDT techniques.

* Corresponding author: J. Dumoulin jean.dumoulin@ifsttar.fr

SALT CRYSTALLIZATION EFFECTS ON BASALTS OF DIYARBAKIR CITY WALLS, TURKEY

Dursun, F.*; Topal, T.

Middle East Technical University, Department of Geological Engineering Ankara, Turkey

The Diyarbakir Citadel and City walls are artifacts of human history. It is a result of various cultures combined throughout the different historical periods. The structure is shaped from basalts of Karacadağ Volcanic Complex.

Based on the field surveys, basalts with two different types of textures were used in the Diyarbakir City Walls. These are classified as massive and vesicular basalts. The City Walls reveal some signs of deterioration forms such as detachments, discoloration, microbiological colonization and material loss due to weathering activities.

Salt crystallization is one of the major weathering agents observed on the different sections of the City Walls. In order to examine the resistance of the construction material against salt crystallization, a series of laboratory experiments were performed with $MgSO_4$ on the basalts. The change in physico-mechanical properties of the basalts including effective porosity, weight, dry unit weight, water absorption, dry and saturated sonic velocities, and uniaxial compressive strength (UCS) has been studied for various stages of the ageing tests. The results demonstrate that the crystallization of $MgSO_4$ is strongly influenced by the presence of calcite and clayey infilling in the rock material and texture of the basalts.

* Corresponding author: F. Dursun felatdursun@gmail.com

NANOTECHNOLOGY AND DIGITAL RECONSTRUCTION IN CULTURAL HERITAGE: THE CASE STUDY OF THE GUARDIAN ANGEL IN REGGIO CALABRIA (ITALY)

Ebolese, D.[1*]; La Russa, M.F.[2]; Ruffolo, S.A.[2]; Bruno, F.[3], Peluso, R.[3]; Nigrelli, F.[4]; Arcudi, A.[5]; Costanzo, A.[6]; Musacchio, M.[7]; Buongiorno, M.F.[7]

[1] Master in Nanotechnologies and Nanomaterials for Cultural Heritage, University of Palermo, Italy, [2] Biology, Ecology and Earth Sciences Department (DiBEST), Arcavacata di Rende (Cs), Italy, [3] 3D Research, Arcavaca di Rende (Cs), Italy, [4]Soprintendenza belle Arti e Paesaggio della Calabria, [5] Private Restorer, Reggio Calabria, Italy, [6] National Institute for Geophysics and Volcanology (INGV), Rende (Cs), Italy, [7] National Institute for Geophysics and Volcanology (INGV), Rome, Italy

Technologies available nowadays offer several possibilities to cultural heritage, and allow to achieve satisfactory and impressive results in conservation, documentation and representation. The present research is an integrated multi-analytical approach aimed at the conservation restoration and fruition of a marble statue representing S. Michele Arcangelo, called the guardian Angel, located in Reggio Calabria, Italy. The statue, carved in 1637 probably by Placido Brandamonte from Messina, is one of the few evidences of the XVII century in Reggio Calabria Town. Macroscopically it is possible to recognize several biological forms of decay, mainly due to the location of the statue in outdoor environment. For this reason, the study was focused on the photocatalytic properties of titanium oxide, as new alternative safe and environmentally friendly approaches for disinfection of stone materials.

In particular the research was organized into three different steps:

- Laboratory tests. Marble samples were treated with two different coatings: TEOS and NANOESTEL with different amounts of TiO_2. Colorimetric measurement, UV radiation and contact angle were carried out in order to evaluate the interaction between products and stone materials. Methylene blue degradation test was made to define the self-cleaning property of each product. Finally, multispectral analysis, with a spectroradiometer, was performed in order to assess the possibility to determine TiO_2 concentration on specimens' surface.

- Application in situ of the selected coatings to prevent further biological colonization. On the basis of the laboratory results, two products were applied on the statue after the cleaning procedures. Colorimetric test was made to check the color variations on the stone surfaces, while the monitoring of the antimicrobic efficacy “in situ” is still in progress.

- The last step was addressed to the fruition of the statue. Photogrammetric survey (with Nikon D800 and GoPro Hero4Black) has been carried out in order to take advantage of reality-based 3D models, used in many applications like monitoring, documentation, conservation, animation, etc. Data were processed to obtain 3D information (3D model and video) with a millimetric accuracy, which integrates the completeness of traditional photographic documentation with the ability to interact with the 3D model, making possible the examination of all details of the subject, anytime and anywhere.

* Corresponding author D. Ebolese donatellaebolese@gmail.com

INVESTIGATION OF MOISTURE AND SALT SOLUTION BEHAVIOUR IN BUILDING STONES UNDER FIELD AND LABORATORY CONDITIONS

Egartner, I.*; Sass, O.

Department of Geography and Regional Science, University of Graz, Graz, Austria

The presented project deals with the behaviour and distribution of moisture and salt solution in porous stone material and their relationship to weathering phenomena. The investigation was focused in field on a 300 hundred year old boundary wall of the Worchester College in Oxford, UK, as well as, under laboratory conditions on blocks of a porous limestone (Aflenzer stone, Austria). A multi-method approach was applied on the masonry of the College wall: (1) Mapping of weathering phenomena; (2) Electrical Resistivity Tomography (ERT); (3) Handheld Moisture Meter; (4) Paper pulp poultices (PPP); (5) Ion Chromatography (IC). Lab analysis, based on the analysis of the capillary absorption coefficient and the capillary rise behaviour of the samples, including sampling by drilling, PPP, conductivity sensor and IC. The methods were applied on stone cubes of a porous limestone (5x5x5 cm), which were soaked first with ultrapure H_2O and second with different concentrations (0.1 mol/l, 0.5 mol/l and 1 mol/l) of a saline solution of NaCl and Na_2SO_4. The analyses were carried out at the department of applied geoscience of the Technical University of Graz, Austria, as well as, at the Oxford Rock Breakdown Laboratory, School of Geography and the Environment, University of Oxford, UK. We take aim on four points:

- Distribution of salt ions and moisture at the stone surface and subsurface and their relationship to weathering phenomena (disintegration, soiling, cavernous weathering);
- Behaviour and distribution of water and salt solution of known concentration in a porous material at different saturation states under laboratory condititions;
- Mechanism, reliability and quantitative effectivity of salt sampling by PPP;
- Comparison of results of the laboratory analysis to those of the field campaign to achieve (semi-)quantitative information on salt concentrations.

2D-geoelectric profiles, supplemented by capacitive measurements and PPP, show that both water and salt ion content are heightened in the zones where weathering phenomena occur. Different salt solution concentrations are well mirrored by the range of the measured conductivity values [µS/cm] under laboratory conditions. Based on our lab investigation, we assume that approximately 4 – 50 % of the salt ions move into the poultice within the application time of one hour, depending on the amount of salt concentration (0.1 mol/l, 0.5 mol/l and 1 mol/l) and the saturation level (approximately 10 – 100 %) of the stone cubes.

* Corresponding author: I. Egartner isabel.egartner@uni-graz.at

MULTIANALYTICAL APPROACH IN THE CHARACTERIZATION OF LIME MORTARS OF TEMPLE OF DIANA, MÉRIDA

Ergenç, D.[1,2]; Fort, R.[1]

Geosciences Institute IGEO (CSIC-UCM), Madrid, Spain, [2] Conservation and Restoration of Architectural Heritage Program, ETSAM (UPM), Madrid, Spain

Mérida, Emerita Augusta, became an important center of Roman power in the region. The Temple of Diana was which constructed as a holy place in Mérida in the first century AD also has formed a central part of the Roman Forum. Although in the sixteenth century Palace of Conde was incorporated in the interior hall of the temple which is very well-conserved and attract attention with its still standing original Corinthian columns. It is part of Archaeological Ensemble of Mérida which was declared as World Heritage Site by UNESCO in 1993.

In this study, Roman mortars of the Temple of Diana (Fig 1) that are collected from different parts of the religious monumental building were characterized by means of different analytical techniques. Mineralogical analyses were carried through optical microscopy, X-ray diffraction (XRD), thermogravimetric analysis and differential scanning calorimetry (TGA-DSC), color spectrometry, Raman and chemical analyses were conducted by X-ray flourescence (XRF).

The results of the analyses reveal that all samples have variety of igneous and metamorphic rock fragments and angular to semi-angular quartz feldspar biotite aggregates embedded in a carbonated lime binder (Fig 2). Colors of mortar samples vary in white-yellow range with high luminosity. Microscopic and XRD analysis results reveal the micritic calcitic binder and quartz feldspar and biotite aggregates with rock fragments. Some of the mortars have the ceramic content and lime lumps. Two samples include gypsum which could be also proved by Raman and XRF analysis. According to TGA analysis except two samples, they have hydraulic properties.

Figure 1. Temple of Diana

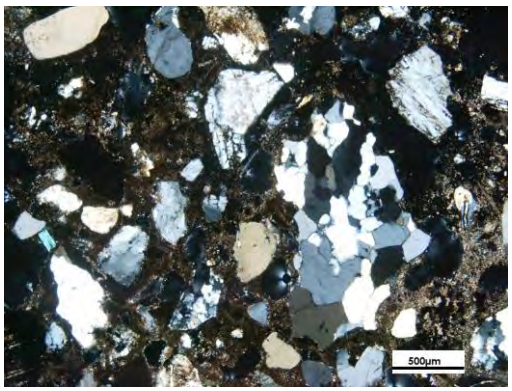


Figure 2. Photomicrograph of mortar sample from the wall of the temple (Cross nicols, 4x)

This research is funded by the project CLIMORTEC (BIA2014-53911-R) and by the program Geomateriales2 (S2013/MIT2914) of Community of Madrid.

* Corresponding author: D.Ergenç duyguerg@ucm.es

THE TRACES OF THEIR EXISTENCE: DOCUMENTATION OF INSCRIPTIONS OF THE BRICK BARRACKS OF FORMER CONCENTRATION CAMP AUSCHWITZ II IN OŚWIĘCIM, POLAND

Escamilla Martínez, M.*; Springer, S.

Cologne Institute of Conservation Sciences (CICS), TH Köln, Cologne, Germany

During the last three months of 1941, the construction of the concentration camp Auschwitz II-Birkenau in Poland started. During World War II, the National Socialists enslaved and tortured prisoners; some of them were forced to build a quarantine camp (later called camp-B I) out of reused bricks from the houses in and surrounding of the village Brzezinka. The new camp was to be part of a new complex planned to detain about 100 000 prisoners, including latrines, showers, kitchen and sleeping barracks. In 1942, the newer barracks were constructed out of wood instead. After the liberation of the camp and the further development of the museum, most of the wooden barracks were dismantled, leaving the still existing B I complex intact (according to Strezelcka and Setkiewicz, 1999).

Over the active times of the camp, some prisoners left traces of their existence and imprisonment by engraving or writing their names, prisoner numbers, addresses, birthdates or simply drawing on the bricks of the barracks. The inscriptions had been noticed by visitors and museum staff before, but the information contained in them had not yet been entirely documented.

As part of a collaboration between the *Auschwitz-Birkenau State Museum* and the *Cologne Institute of Applied Sciences,* the documentation of prisoner inscriptions on the brick barrack façades of the Birkenau camp Auschwitz II began in the summer of 2015. The project included the design of a suitable catalogue to precisely find and, if possible, interpret the inscriptions left by prisoners. A map of the camp with the quantity of rediscovered inscriptions was made to create an overview of the location and amount of findings. Thanks to this, patterns of often used walls could be identified, enabling the buildings with the most inscriptions to be documented - reaching about 200 inscriptions up to now.

This joint work created the possibility of future archival of newly discovered names and information of some of the people who were inprisoned during the time of the extermination in the camp Auschwitz-Birkenau.

Strzelecka, P. Setkiewicz. 1999. Bau, Ausbau und Entwicklung des KL Auschwitz und seiner Nebenlager. In: Auschwitz 1940-1945. Studien zur Geschichte des Konzetrations- und Vernichtungslagers Auschwitz. Band I.

* Corresponding author: M.Escamilla Martínez mcescamillam@gmail.com

INFLUENCE OF CONSOLIDATION IN DESALINATION OF ARCHAEOLOGICAL CERAMIC

Feliciano, I.[1*]; Lima, A.[1]; Neves, O.[2]; Dionísio, A.[2]

[1] FCT-UNL, Almada, Portugal, [2] CERENA/ IST-ULisboa, Lisboa, Portugal

Archaeological ceramic objects frequently present salt contamination associated with granular disintegration problems. Salt decay leads to both aesthetic damage by the formation of efflorescences and physical damage, through intergranular incoherence of the material. The removal of soluble salts from contaminated ceramics by diffusion, namely, water bath, is a widely and effective accepted method in archaeological ceramics conservation. Therefore, for the salt removal of very fragile artefacts it is fundamental to use a pre-consolidation agent to restore some strength of the ceramic, and thus allowing it to be submitted to desalination treatment. However there are not many scientific studies regarding the behaviour of ceramics along the process of consolidation followed by desalination. The pre-consolidating agent must be able to reticulate and remain active in the presence of salts and water, as well it should not limit the desalination process and not trigger secondary effect to the ceramic objects.

An experimental study was designed to understand the behaviour of an artificial contaminated ceramic material, submitted to pre-consolidation and then subjected to bath desalination process. Red ceramic probes were fired at 980ºC, aged with a 14% pure NaCl solution and submitted to seven salt weathering cycles (an average amount of NaCl of 12.5% was introduced in the probes). Afterwards two commercial consolidation products, an ethyl silicate (Tegovakon V®) and an acrylic resin (Paraloid B-72®) were applied on the dry contaminated ceramic material by total immersion during four hours, followed by 21 days of polymerization.

For the desalination process the probes were separately immersed in a static bath with equal amount of ultrapure water, changed every 24 hours until reached a limit of 150 μS cm^{-1} in the extraction bath. Parameters as pH and electrical conductivity were measured in the aqueous solutions containing ions recovered in the desalination baths before filtration and then analysed by ion chromatography to quantify their chloride content.

The efficiency of consolidation products in the presence of salts was evaluated, before and after desalination bath process and included changes in the chromatic parameters, ultrasound velocity, point-load strength and micro-drilling resistance.

Preliminary results show that both consolidants present similar performances in terms of physical behaviour with an average increase of 8% in terms of p-wave ultrasound velocity, without compromising the desalination efficiency. Similar results were obtained in terms of point-load strength and micro-drilling resistance. After desalination they remain active improving the ceramic strength. The major amount of salt was removed after the first 24 hours. Over the following days the salt and chloride content decreased steadily and equivalently in both consolidants. The artificial contamination with NaCl mainly induced a reduction in lightness (average reduction of 10 units) effect that was attenuated with the application of both consolidants and mainly with the desalination process (with CIELAB values approaching those of non-contaminated samples).

* Corresponding author: I. Feliciano inesfeliciano@gmail.com

ARCHITECTURAL HERITAGE: A TODAY CRITICAL REVIEW FROM A SPANISH PROSPECTIVE

Fernández Cueto, P.*

Technical University of Madrid (UPM). Higher School of Architecture (ETSAM), Madrid, Spain

Rehabilitation, Restoration, Recycling and Reuse are increasingly quoted terms, and often used uncritically and superficially, even seeking their "fashionable sound". After the crash of the Spanish property bubble and the lack of building new projects, we are now noticing the first symptoms on intervention on Architectural Heritage. That is, in this field some criteria have been distorted for the sake of saving on resources and "smart" reuse of our heritage; concepts that are placed as starting points to a new search of capital to reactivate our economy.

What new approach can we offer to operate in our Heritage? Restoration theory and practice have arisen as contraries, on occasions almost impossible to understand. On that point, methodology and criteria acquire an essential role. Nowadays more than ever it seems necessary to be precise on the definition of interventions, from the theory to the practice (Torsello, 2005). We require meticulous rigor in all fields, but we plunge into a sea of platitudes when dealing with heritage. Some terms are used as synonyms, some are exchanged: restore to rehabilitate, reconstruction to recover...

Concepts such as "original" and "respect" are so challenged today that they become empty. Instead, others such as "authenticity" or "patina", concepts already expressed by Riegle, seem to have been forgotten (Jokilehto, 2006). Similarly when speaking about Restoration, it is not clear which is the way in some interventions; perhaps they are still into "Historic Restoration", or into "Purism or Stylistic Restoration", others into "Philological Restoration", "Scientific Restoration" or why not in the recent years, into "Critical-Conservative Restoration". All this confusion shows a clear absense of judgment.

With this work, I intend to launch a critical review of current use of distorted criteria in conservation. In Italy, concepts such as "patina", the past of the time (Squassina, 2013), "aggregati", mechanical surveys and even the relationship between matter and damage have been re-studied and re-thought in the last decade. In the same way they should be analysed from the Spanish perspective to obtain a global vision when intervening on Architectural Heritage.

Jokilehto, J. 2006. Considerations on authenticity and integrity in world heritage context. City & Time 2 (1):1-16.
Torsello, P. 2005. Che cos'è il restauro. Nove studiosi a confronto. Venezia: Marsilio
Squassina, A. 2013.Tempo che distrugge, tempo che conserva, sentimento del tempo nel restauro. Venezia: Il Prato.

* Corresponding author: P. Fernández Cueto f.cueto@gmail.com

ICONIC GLASS PAINTING, AN ART TECHNIQUE THAT DETERMINES A CULTURAL IDENTITY

Foanene Petcu, A.[1,2*]

[1] *West University, Timişoara, România,* [2] *YOCOCU România*

Romanian glass-painting represent an interesting interference between the Eastern tradition and European Western painting technique. This painting technique is the expression of a cultural result of a geopolitical reason. In the late 17th century Transylvania and Banat were annexed by the Habsburg Empire. That time, the glass painting technique was a particular expression of the Bohemian region and Austrian artistic emergence. After the conquest, the technique was brought in Transylvania and Banat in order to convey the new esthetic standards. In times of war and oppression, Romanian peasants found cultural ways to adapt by understanding, learning and applying the language, the requests and the esthetic standards of their victors. Painting on glass can be considered through the most pleasant adaptation terms. This technique presented a large rage of advantages: it could be practiced at home, after the working hours/seasons, it was relatively cheap to produce, it satisfied the iconographic needs of the community, it had a real market and, most important, it represented an esthetic field of freedom imagery.

Those paintings where still conditioned by the existence of its raw materials: glass for the panel and wood for the frame. The sacred- naïve image was painted behind the glass panel, the front part of this one fulfilling the protected part of the work. The firm outlines, final details and the lettering had to be painted before applying the background color tones. The presence of the gold leaf is a rare case and it underlines the social and economic status of the client. After the painting was being finished, the work was fixed in a wood frame and back protected. Topics like: *The Resurrection, The Mystical Winepress*, saints as: *Saint Nicholas, Saint Haralambos, Saint George, Saint Elias,* and, of course, different variants of the iconographical postures of the *Mother of God* figure between the most important themes.

The technique reached its apogee between 1750 and the end of the nineteenth century. Glass painting emerged and spread throughout Transylvania and Banat regions of Romania in the first decades of the eighteenth century. By the 19th century, glass iconography had reached an important level of expression. During the period between the two World Wars, when the mass-produced lithographs of holy images imposed as values on the Romanian sacred art market, glass painting almost vanished. The artistic enthusiasm for traditional arts and crafts of the 20 century, the interest of modern art for this particular naïve- religious imagery, the dynamics of the political and esthetic adaptation through art language have transformed this failing folk art form to a well highlighted subject towards different mediums during contemporary period.

Those are the reasons for witch I want to develop a study about the resources of the Romanian iconic glass painting, a phenomenon that transformed a painting technique into an item of our cultural identity.

*Corresponding author: A. Foanene andreea_foanene@yahoo.com

CHARACTERIZATION AND STRUCTURAL ANALYSIS OF THE MAIN FAÇADE OF "PALAZZO CARELLI-PIGNATELLI" IN FIUMEFREDDO BRUZIO, ITALY

Forestieri, G.[1*]; Tedesco, A.[2]; Ponte, M.[1]

[1] Department of Biology, Ecology and Earth Sciences, University of Calabria, Arcavacata di Rende (CS), Italy, [2] Department of Civil Engineering, University of Calabria, Arcavacata di Rende (CS), Italy

Fuscaldo sandstone, commonly named as "tuff" and commercially known as "pietra dolce" due to its easy workability, was utilized in the past by the most important Calabrian schools of stonemasons, to realize structural and ornamental elements, such as buildings, arches and portals of many Calabrian Thyrrenian historical centers. In particular it was employed as building and ornamental material by the "School of Fuscaldo" from the the XII to the XVIII century.

In this work has been performed a study of characterization, evaluation of sandstone deterioration with a structural analysis of mechanisms of collapse and instability of the main façade of an important building of the old town of Fiumefreddo Bruzio, situated in the Province of Cosenza (Italy). The case study where have been carried out tests *in situ* and laboratory analyses, has been "Palazzo Carelli - Pignatelli" of the XIV century, an important example of the Calabrian architectural Renaissance.

Non-destructive tests have been performed in situ in order to assess physical-mechanical properties of the building material and its state of conservation. A preliminary architectural contextualization has been essential to evaluate principal characteristics of the case study and to highlight the macroscopic effects of deterioration. Building type analysis was obtained through a field survey and direct measurements. The mechanical properties of sandstone have been assessed on site by means of Schmidt Hammer Hardness Test and by ultrasonic pulse velocity test. Moreover a structural analysis has been performed in order to assess the different mechanism of collapse that affects the entire façade.

The results of the tests and the structural analysis performed, have provided a preliminary comprehensive understanding of the level of deterioration and instability of the examined case study.

* Corresponding author: G. Forestieri giulia.forestieri@unical.it

^{29}Si AND ^{1}H NMR STUDY OF WATERPROOFING POLYMERIZATION

Fortes-Revilla, C.[1]; Blanco-Varela, M.T.[2]; Martinez-Ramirez, S.[3]*

[1] SIKA, Alcobendas, Madrid, Spain, [2] Eduardo Torroja Institute for Construction Science (IETCC-CSIC), Madrid, Spain, [3] Institute for the Structure of the Matter (IEM-CSIC), Madrid, Spain

Lime mortar, a construction material used by the ancients and still in use today, is characterized by its vulnerability to physical, chemical and biological attack, in which water plays an instrumental role.

Surface coatings may be used to enhance its durability. As such coatings are applied to the outermost surface; they are the materials most liable to deteriorate. Due to the tiny amounts involved, however, it is difficult to judge when they are in need of restauration and/or replacement. Spectroscopic techniques are generally non- and at most semi-destructive, as they require only small amounts of sample; moreover, they are very useful for studying surface coatings. ^{29}Si and ^{1}H NMR were used in the present study to characterize different waterproof coatings before and after their application into lime mortars. Polymerization reactions were studied over an evaporating dish, without interaction with the substrate. Interaction and polymerization of the coating over the lime mortar was also studied by the same spectroscopic technique.

Two waterproofing materials were used (“Hydrophase superficii” and “RC-80”). The first one was found to be a mixture of tert-butyl-trimethoxysilane partially polymerized (31%) and ethyl silicate. The second product proved to be a mixture of poly-methyl-siloxane and ethyl silicate. Initially 86% of the ethyl silicate and 100% of the poly-methyl-siloxane were in monomeric form.

The two initial compounds in Hydrophase superficii polymerized on evaporating dish to different degrees, with 43% of the tert-butyl-trimethoxysilane and 33% of the ethyl silicate reaching maximum polymerization at the end of the test. They polymerized more fully when that product was applied on lime mortar surface, with 60% of the tert-butyl-trimethoxysilane and 40% of the ethyl silicate reaching maximum polymerization.

Poly-methyl-siloxane failed to polymerize on evaporating dish, whereas 86% of the ethyl silicate formed polymers. When the product was applied to lime mortar, 80% of the ethyl silicate polymerized to the highest possible degree and poly-methyl-siloxane began to polymerize (20% to the maximum degree).

* Corresponding author: S. Martínez Ramírez sagrario.martinez@csic.es

BUILDING STONES OF THE CONVENT OF TRINITARIAS DESCALZAS AND SAN ILDEFONSO IN MADRID (SPAIN)

Freire-Lista, D.M.*; Fort, R.

Geosciences Institute (CSIC, UCM), Madrid, Spain

Miguel de Cervantes Saavedra was laid to rest at the Convent of Trinitarias Descalzas and San Ildefonso (Madrid) in 1616. The original convent dates back to 1612. In 1673 construction of the church commenced. Once the church was completed in 1696, the reconstruction of the convent began, acquiring its current form.

The stones used in the construction of this convent are those which were traditionally used in Madrid. It features flint masonry sockets on the facades, which face towards the streets of Lope de Vega and Cuesta de las Trinitarias. The rest of the sockets were built with granite ashlars (Piedra Berroqueña), with crystal-size from fine to medium. Granite is also located in the arcades of the main facade and is present in other elements such as the jambs and lintels. The ornamental part of the building is carved from dolomitic stone, and shows loss of cohesion and soiling. Scaling, saline efflorescence, anthropic decay, microcracks (detected by fluorescence microscopy techniques) is present in the granite. The flint stone are the best preserved.

Knowledge of stones, historic quarries and causes of stone decay are necessary for conservation interventions, especially for reintegration of damaged ashlars and replacing the original stone with compatible materials. Madrid flint comes from ancient quarries near Madrid. Based on its petrological characteristics, the granite was extracted from Moralzarzal quarries, while the dolomitic stone extracted corresponds to the Cretaceous formations of Madrid, called Redueña stone.

The study of historical documentation of building stones complemented by petrographic and fractographical techniques provides very useful data for the dating of historic buildings, as well as other disciplines such as history, archeology, restoration, fine arts, architecture and forensic science.

Research funded by Geomaterials 2 (S2013/MIT_2914) Programme.

* Corresponding author: D.M. Freire-Lista d.freire@igeo.ucm-csic.es

NEW INSIGHTS FOR CREATIVE PROCESSES IN ART. COLLABORATION AND MATERIAL EXPERIMENTATION WITH CONTEMPORARY ARTISTS

Fuentes Duran, E.M.; Amor Garcia, R.L.*; Soriano Sancho, M.P.

Universitat Politècnica de València, Valencia, Spain

The limits of Art do not seem to be clearly defined for the contemporary artist. This is one of the main concerns that art restorers face in the conservation of particular artworks which have been created using heterogeneous materials of unknown composition or taken from outside the artistic range. The research of contemporary artists beyond the old boundaries of Art is also seen in the techniques and processes used nowadays for the creation of the pieces themselves, as it is the case of the artists Patricia Gomez and Maria Jesus Gonzalez. These two Spanish artists create art pieces in which the most representative element is the use of adapted mural detachment techniques. Despite that the intention, materials and results differ from art restoration orthodoxy, the procedure reminds us of that of the Italian *strappo* technique used in Restoration.

In a recent art project, Patricia Gomez and Maria Jesus Gonzalez have begun to experiment and become more familiar with the "traditional" *strappo* and its most common form, contacting art restorers specialized in this field. The artists expected to learn from restorers about the possibilities of this conservation technique and how it could be adapted to their requirements. This idea was first understood as a collaboration for a single project but, because of the new paths found by the artists, that singular collaboration developed, turning into a lengthy and ongoing collaboration between artists and restorers during the creative process. This broader collaboration evolved into experiments with different materials and techniques to show the different possibilities for artists.

The purpose of the tests, performed by restorers, was to find a satisfactory result for the artists and their final artwork, applying a scientific methodology based on:

- Researching all the materials usually used by them for similar purposes
- Testing new materials with similar physical characteristics, better quality and durability
- Increasing the preservation possibilities of their artworks.

Due to its peculiarity, we would like to exhibit the complete research and the decision-making process followed, also focusing on how the tests were designed and managed, and which were the results obtained with those systems.

Within the project, Art and conservation are blended together and, at the same time, the preservation of artworks delves in the same creative process. We are utterly convinced that both disciplines have much to contribute to one another and, for that reason, we would be keen to present at the 5th Meeting go YOCOCU the world of possibilities that this kind of collaboration opens for artists and restorers worldwide.
Figure 1 shows an example of the painting treatment process of the back.

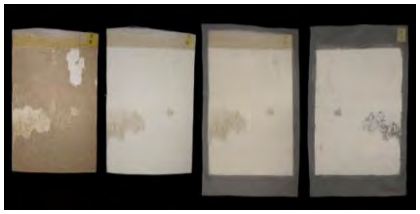


Figure 1. Test of materials

* Corresponding author: R. Amor ritalucia.amor@gmail.com

A WALK THROUGH THE PATH. THE RESTORATION OF A SPANISH ICON AT THE REINA SOFIA MUSEUM.

García, P.; Santabárbara, C.; Martín, R.*

National Museum Reina Sofía, Madrid, Spain

During the last term of 2015 and the beginning of 2016, the Conservation and Restoration Department at the Reina Sofia Museum developed the complete restitution of a replica of the sculpture '*El pueblo español tiene un camino que conduce a una estrella*' (Spanish people have a path that leads to a star).

The original artwork was made by the Spanish sculptor Alberto Sánchez, specially designed for the Spanish Pavilion at the International Exhibition in Paris in the year 1937, alongside other major artists such as Joan Miró, Alexander Calder or Pablo Picasso.

This huge monument harbors both surrealist connotations and political commitment since, at that very moment Spain was suffering a tumultuous period before the Civil War. Unfortunately, the original piece was not preserved once the International Exhibition ended and its whereabouts are unknown until the present day; only a bronze miniature, some sketches and photographs remained.

In the year 2001, within the retrospective of Alberto Sánchez at the museum, a replica of the original sculpture was built using a plaster cast from the copy of the model in bronze, following the photographic documentation preserved. Although the final work could not respect the proportions of the original due to stability issues, it was placed near the museum entrance, on the north façade.

Only fourteen years later, the deterioration of the replica had been increasing through the inclement weather and acts of vandalism. More importantly, the surface presented important cracks, fissures and material losses, altering both its structural safety and artistic meaning. Finally, there was part of the internal metal structure visible to the outside, due to the loss of mortar. These metallic areas also presented severe oxidation.

Figure 1. Sketch of the alterations

For all those reasons, the Conservation and Restoration Department at the Reina Sofia Museum decided to undertake the complete restoration of the replica, first removing all the harmful elements (oxidation, graffiti), then replacing the lost parts and finally recovering the original colour combination of the sculpture from 1937.

Further details of all the process will be given in the full document, such as the selection of the materials, methodological decisions and the photographs taken, including the scaffold montage prior the intervention.

* Corresponding author: R. Martin martin.navarro.rodrigo@gmail.com

THE HERITAGE OF WATER IN DAGANZO (MADRID, SPAIN): RESTORATION OF THE FOUR SEWERS FOUNTAIN

García Alcocer, V.[1*]; Juste Ballesta, J.[2]; Soria Hernanz, E.[3]

[1] Research group Analysis and Intervention in Architectural Heritage (UPM), Madrid, Spain, [2] Directorate General of Historical Heritage of the Community of Madrid, Department of Architectural Graphic Ideation and Master of Conservation and Restoration of Architectural Heritage (ETSAM), Madrid, Spain, [3] School of Conservation and Restoration of Cultural Heritage, Madrid, Spain

The paper's field focuses on the Restoration of the Four Sewers Fountain of Daganzo and the improvement of its inmediate environment, linked to the "Plan of Fountains and Historical Gardens" of the Regional Government of Madrid.

Historically, this element has been a reference at a territorial level, being part of troughs net and cattle trails for livestock, besides urban scale, serving public utility and point of drinking water supplying for the village.

The intervention has had a dual purpose. On the one hand, monument's enhancement, recovering the original presence of the Fountain, altered after paving works of the square in 1985, which left it half-buried. On the other hand, save pile of laundry's memory, demolished on the same date, making it the main character of a new public space created around the pylon, which recovers its social role as meeting place for neighbors.

This process has benefited from a deep archival previous search; documentation, conservation and display of archaeological remains discovered; and a thorough restoration work to return its values to this Cultural Heritage Property.

Figure 1 shows the image of the fountain square, comparing pre- and post-restoration states.

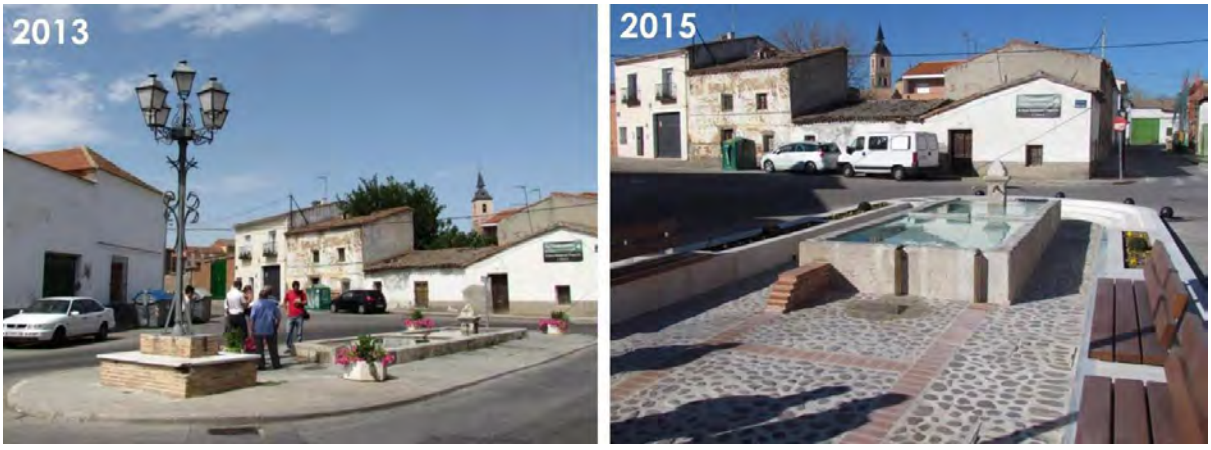


Figure 1. Image of the Fountain Square, comparing pre- and post- restoration states (2013 vs. 2015)

* Corresponding author: V. García Alcocer vgalcocer@vgarq.com

THE INMANENCE OF RESTORATION

García Morales, L.[1]; Mellado Martínez, D.[2*]

[1] Universidad Politécnica de Madrid (UPM), Madrid, Spain, [2] HelpMeImFamous! (New media art production and conservation), Madrid, Spain

Immanence opposes transcendence. An activity is immanent to a thing when the activity has its end inside that same thing. Restoration –understood as restoration and conservation- is immanent: its end is inside itself; it is united to, and inseparable from, its essence.

The description of Restoration processes discloses a hierarchy of logic types, which are immanent to the object. In order to avoid misunderstandings and paradoxes, logical levels must be strictly separated. *Traditional* or *pre-modern art*, *contemporary art* and *new media art* are members of the same class or group: *art*. But considering all of them members of the "traditional" art class means a logical categorization mistake, since "traditional" *art* cannot be member and class at the same time. Each member of the *art* class has its own essence or substance that, because of its inherence, defines Restoration. That is the reason why considering "traditional" art Restoration a class -instead of a member- means making a logical categorization mistake.

This paper presents the paradoxes -from a Restoration point of view- that arise when *contemporary art* and *new media art* are considered "the same thing"; key features that differentiate them are stated; "traditional" Restoration foundations – authenticity, objectivity, universality and reversibility- are questioned and its unsuitability, analyzed. A new point of view, compatible with the immanent action of Restoration, is proposed. The object of Restoration determines the teleology of Restoration. And that relation has to evolve as long as it is internal to the object or set of objects and not the result of an external action to the objects.

* Corresponding author: L. García Morales lino.garcia@upm.es

BOHR PAVILION, DANISH TRADITION AND MODERNITY

García Sánchez, C.*

Universidad Politécnica de Madrid ETSAM, Madrid, Spain

Niels Bohr´s guest house (1957) was the first building by the Danish architect Vilhelm Wohlert (1920-2007). Rooted into the Danish tradition and the principles of the *Skønvirke*, represents a renewal based on absorption of foreign influences: American architecture and Japanese tradition. Wohlert´s work ranges to different kind of commissions. Despite their disparate scales and functions, they show Wohlert´s commitment to human comfort, his dedication to precise construction, and the respect for materials. Features that are more evident than nowhere in the modest guesthouse that he created for Niels Bohr, Nobel Prize in Physics (1922), in a remote virgin forest in the northern of *Sjælland*.

He creates an abstract self-contained object that preserves the open space of the clearing around it. The architect´s task will be understand the vocation of the place, establishing a new site where architecture and nature will live together, the "*genius loci*" will endure. The individual is readied for the experience of architecture, where the manner of approaching the building becomes significant. The perception is slowed in order to deprive the user of mental assumptions and in this way a level of intimacy is reached. The building alludes to the modern concept of the pavilion as a piece that is conceptually its own entity.

The adopted solution seems deceptively simple; a floating timber clad box, over a flat platform, opened to the southwest and closed to the northeast. The wood box has the responsive character of a living organism, which is always changing according to variation in daylight or temperature. The building alludes to the fact that everything in nature is constantly undergoing change and evolution. Folding doors and shutters generate extensions of the rooms. The unexpected lack of closure, the air circulation and the elements that give flexibility, create an evocative air of freedom and fluidity. This circumstance reminds the idea, first formulated by Heraclitus, that the world is a flow statement. It performs an example of the modernity as the refinement in the technique of boundaries and the idea that architecture is not a material object but the space generated inside. It could be seen as an *ikebana*, the Japanese art of flowers; "*the art of space*" where is produced a circulation of air between its components. *Ikebana* is something alive that expresses features of the building; the third dimension, the asymmetrical balance, an interest for the material, its texture and the emotional effect that emanates. The architect establishes an intimate relationship with materials which express their age and their wear together with the enriching experience of time. The wood ages and returns to the earth and in this way the building disappears, and thus is a connection made with both ecology and death. The concept of the elimination of the superfluous and the exhibiting of a material's natural aspect are common to Oriental culture. It is architecture designed for the perception of all the senses. As traditional Japanese house, the architecture is adjusted to the measure of man, the human scale. The keys of its aesthetic effect are its harmony and balance, conveying serenity and beauty. The encounter with nature is the most basic lesson of project, but the Danish attitude towards her is not domination but conciliation, where a world of relationships is gentle to human beings. It is a lesson of the thought that nature, life and architecture are united.

*Corresponding author: C. García Sanchez arquitectocarmen@gmail.com

CONSERVATION AND RESTORATION STUDIES OF RUSSIAN SWORD FROM THE YEVSTAFIY WRECK IN CESME, TURKEY

Genc, U.*

Central and Regional Laboratory for Restoration and Conservation, Istanbul,Turkey

Cesme is a settlement and a harbor situated on the promontory of a peninsula that projects out over the Aegean Sea, in Western Anatolia. In Turkish Naval History, Cesme also grieves in rememberance of “The Sea Battle of Cesme”, which had an important impact on Turkish maritime history when the Ottoman Armada was destroyed by the ships sent by the Russians in 1770. As a result, the fortress and city were looted by the Russians. In this war, the burning main mast of the one Turkish vessel fell onto the ship the admiral ship called “Yevstafiy” and in a few minutes Yevstafiy blew off.

Diving studies were started in 1996 and a sword was removed from the Yevstafiy wreck. This sword hasn't been touched in 20 years and in 2016 year was moved to the laboratory for conservation.

In this study, Computed Tomography (CT) was used for the 3D model and to see the corruption of the sword in the acrabbard. We used 3D scanner and 3D printer technology in fort his restoration Project. This paper explains the methods of documentation, cleaning and analysis and active conservation process.

* Corresponding author: U. Genc ugur.genc@kultur.gov.tr

NON INVASIVE CHARACTERIZATION OF INKS AND PIGMENTS OF A MEDIEVAL PARCHMENT LAMINATED MANUSCRIPT

Genua, G.[1*]; Di Bella, M.[1]; Alberghina, M.F.[2]; Brai, M.[2]; Fontana, D.[2]; Tranchina, L.[3]

[1] Corso di Laurea in Conservazione e Restauro dei Beni Culturali (PFP 5), University of Palermo, Italy, [2] Dipartimento di Fisica e Chimica (DiFC), Univeristy of Palermo, Italy, [3] Advanced Technologies Network Center (ATeN Center), University of Palermo, Italy

The subject of this work is an extraordinary unique medieval manuscript, (ms.02 ID code) of the Historical Diocesan Archive of Palermo, Italy. The codex was carefully studied and, after the necessary scientific analysis, it underwent a complex conservation treatment.

The manuscript is an illuminated liturgical parchment codex and it is one of the few surviving manuscripts made in the Latin scriptoria active in Palermo around the middle of XII century, and shows the evident and unique cultural syncretism of the period and the fusion of Byzantine, Arabic and Latin elements in Sicily. The condition of the codex was quite singular because during a previous restoration it was laminated with a PVC film applied with an acrylic adhesive in 1965 that raised serious concerns for its future survival.

In order to plan the most appropriate treatment, non-destructive X-Ray Fluorescence (XRF) analysis and observation with digital microscope under visible and UV light were carried out in situ to identify the chemical composition and the nature of inks and pigments used for the text and the decoration before the extremely challenging removal of the lamination film. The results provided also important information about the decoration's technique and the history of the codex, revealing unknown data. Among the first interesting result was the discovery of two kind of blue pigments used both for the coloured (in red and blue) and decorated painted initials.

These pigments are very different in quality, this therefore suggests the possibility of at least two stages of decoration when the available funds were probably quite different. The second important and unexpected result was the clear presence of chemical elements in some apparently unpainted areas. The observation under UV light, showed the typical fluorescence of specific dyes and XRF analysis confirmed the presence of a possible preparation layer for the unfinished decoration.

The preliminary diagnostic analysis on inks and pigments, before the intervention, allowed not only to carefully plan the conservation treatment but gave also the possibility to gather new information about this unique manuscript, starting to outline specific features of one of the few Norman codices produced in medieval Sicily, now spread throughout Europe and that definitely deserve deeper attention.

Portable X-ray Fluorescence Spectrometry. Capabilities for In Situ Analysis. Edited by Philip J Potts and Margaret West, The Royal Society of Chemistry 2008

* Corresponding author: G. Genua giadagenua@yahoo.it

EVALUATION OF NANOSTRUCTURED COATING FOR THE PROTECTION OF STONE

Germinario S.[1*]; Baldi G.[2], Dami V.[2], Fernandez F.[3], Livreri P.[3]

[1] Master on Nanotechnology and Nanomaterials for Cultural Heritage, University of Palermo, Italy, [2] CE.RI.COL. Colorobbia Research, [3] University of Palermo, Italy

The aim of this study is the evaluation of the effectiveness of nanostructured products on Apuan marble (Vaselli et al 2007). Stones are generally affected by environmental conditions and polluting agents, which cause serious processes of deterioration.

This work focuses on the experimentation of different accelerated aging tests to evaluate the effects of decay and its nature on decorative and building stones (Bityukova 2006). Subsequently, the application and the evaluation of nanostructured products used as protective is performed. In particular, rock samples were exposed to high temperature cycles in a muffle furnace (Yavuz et al 2010), treatments in saline solution (Zedef et a. 2007), cycles of thermal shock (Yavuz et al. 2006) and to ageing by SO_2 action in presence of humidity (UNI EN 13919:2004).

Before and after every artificial aging cycle, appearance changes were observed and chemical - physical properties parameters were measured in order to compare the differences in fresh and treated specimens.

After evaluating the effects of the decay, different nanostructured products were applied and tested on the surface of the samples. Measurements of contact angle, evaluation of the photocatalytic properties by methylene-blue degradation tests, photodegradation kinetics of pollutants under UVA irradiation were performed on all types of samples.

Scanning Electron Microscope analysis were performed before and after each application to evaluate changes in the surface morphology of the samples.

The results show that the product based on titanium dioxide nanoparticles works well as photocatalyst on marble because it remains on the top of the surface.

Furthermore, the hydrophobic products have proven successful because they prevent the passage of the water from the internal layers of the stone.

Vaselli L., Mancini S., Massa G. 2007 Carta giacimentologica dei marmi delle Alpi Apuane a scala 1:10.000 e sua informatizzazione, Convenzione regione Toscana – Università di Siena, Centro di geotecnologie

Bityukova L. 2006 Air pollution effect on the decay of carbonate building stones in old town of tallinn, Water, Air, and Soil Pollution, 2006, pp. 239-271.

Yavuz H., Demirdag S., Caran S. 2010 Thermal effect on the physical properties of carbonate rocks, International Journal of Rock Mechanics and Mining Sciences, pp. 94-103.

Zedef V., Kocak K., Doyen A., Ozsen H., Kekec B. 2007 Effect of salt crystallization on stones of historical buildings and monuments, Konya, Central Turkey, Building and Environment, Elsevier, pp.1453-1457.

Yavuz H., Altindag R., Sarac S., Ugurl. 2006 Sengun N., Estimating the index properties of deteriorated carbonate rocks due tofreeze–thaw and thermal shock weathering, International Journal of Rock Mechanics & Mining Sciences, Elsevier, pp. 767-775.

* Corresponding author: S. Germinario ge-silvia@hotmail.it

THE IMPACT OF ACID EXPOSURE ON BUILDING STONES STUDIED BY X-RAY COMPUTEDMICRO-TOMOGRAPHY

Gibeaux, S.[1*]; Vazquez, P.[1]; De Kock, T.[2]; Cnudde, V.[2]; Barbin, V.[1]; Thomachot-Schneider, C.[1]

[1] GEGENAA EA 3795, Université de Reims Champagne-Ardenne, Reims, France,
[2]UGCT – PProGRess, Dept. Geology, Ghent University, Gent, Belgium

Interaction of building stones with the environment, and air pollution in particular, leads to their alteration. The link between air pollutants such as SO_2 and stone deteriorations are well known but since the last decades its emissions have decreased unlike NOx. In this new environment, we have to adapt our knowledge on the ageing and weathering of building stones, particularly to make restorations of historical monuments as sustainable as possible.

The aim of this study was to assess the effect of these pollutants, NOx and SO_2, on the weathering kinetics of two building stones. For this purpose, ageing tests in the laboratory were performed simulating acid atmosphere exposure and acid rain runoff. Weathering was assessed by X-ray computed micro-tomography (µCT) on two stones used as restoration material in cultural heritage buildings in among others northern France and Belgium: the Savonnières stone (S) an oolitic limestone, and a reconstituted stone (RS) made of debris of limestone mixed with a cement.

Dry deposition effect was assessed by exposing one sample of each stone to a strong mixed acid atmosphere ($[H_2SO_3]$ = 0.2 mol.l^{-1} and $[HNO_3]$ = 0.5 mol.l^{-1}).Dissolution processes induced by acid rain were simulated by immersing other sample of each stone type in a mixed acid solution at pH=5 ($[HNO_3] = 2x[H_2SO_4]$).The same samples were scanned in fresh state and after 1, 10 and 28 days of testing.

High resolution µCT allowed to visualize the first steps of acid pollutant attack on the stones microstructure. The two tests led to different alterations, mainly salt crystallization foratmosphericexposure and dissolution forimmersion. After only one day of test, µCT scans showed that exposure to mixed acid gas led to salt crystallization preferentially on sample surfaces for both types of stone. The thickness of this salt crust seemed to stay stable until the end of the test. The treatment of the reconstructed scans also highlighted a dissolution step which occurred before the crystallization. The dissolution produced by the immersion test occurred immediately after one day on surfaces and open porosity for both stones, although S dissolved homogeneously and RS showed granular disintegration.

µCT is definitely an innovative and non-destructive technique that allows to observe the changes in the stone microstructure during early weathering stagesin high spatial resolution.

*Corresponding author: S. Gibeaux soizic.gibeaux@univ-reims.fr

MODERN TECHNOLOGIES FOR CONSERVATION OF VILLA ZITO PAINTINGS COLLECTION (PALERMO – SICILY)

Giordano, A.[1]; Schiavone, S.[2]; Rizzo V.[3]; Di Carlo, E.[4]; Barresi, G.[4]; Rotolo, V.[4]; Palla, F.[4*]

[1]Ambra Giordano, Conservator, [2]S.T.Art-Test sas, Italy, [3]Villa Zito – Paint Gallery, Palermo, Italy, [4] Laboratory of Biology and Biotechnology for Cultural Heritage (LBBCH), Dep. STEBICEF, University of Palermo, Italy

In this study we describe the conservative integrated approach performed on 40 paintings, dating from different period (XVII- XX century), belonging to "Fondazione Sicilia " and exposed in Villa Zito paint gallery in Palermo (Mazzocca 2015). Through a multidisciplinary approach both constitutive materials and state of conservation have been determined. Particularly, pigments and executive techniques were identified by non-invasive diagnostic investigation (XRF analysis, UV fluorescence acquisition, and IR Reflectography) as well as previous restorations events.

The study has included the revealing of microbial colonization by using non-invasive sampling methods (Nylon membrane fragment) and molecular biology tools for the identification of microbial taxa (Palla et al 2010). For this reason another aim is the application of sustainable methods as alternative to traditional restoration procedures, which can sometimes be detrimental for artworks, humans and environment. In particular, *in vitro* culture (Nutrient, Sabouraud agar), optical microscopy observations (O.M.) and molecular biology investigations (genomic DNA extraction, PCR, sequencing and sequence analysis) reveal the presence of bacteria colonies belonging to *Micrococcus* sp*., Staphylococcus* sp. *and Bacillus* sp.

In order to remove undesired layers appropriate cleaning protocols have been tested, using gelled solutions at specific pH values or dry cleaning methods (Cremonesi 2011; Daudin-Schotte et al 2013). Agar-Agar or Gellan-Gum hard gels have been utilized in order to remove dirty or proteinaceous layers by adding specific enzymatic solutions in the gels. The enzymatic cleaning has been performed at room temperature (20-23°C); the removal (total/partial) has been obtained after 10 minutes of application (Barresi et al 2015). Instead, on unvarnished and water sensitive paintings, the RCE-dry cleaning method (Rijksdienst voor het Cultureel Erfgoed- Netherland Institute for Cultural Heritage) have been applied following *ad hoc* protocols (Giordano et al 2014; Daudin-Schotte et al 2013).

Mazzocca, S. 2015. Le collezioni della Fondazione Banco di Sicilia. Silvana Editoriale.
Cremonesi P. 2011.L'ambiente acquoso per la pulitura di opere policrome, Collana I Talenti, Padova, Il Prato.
Daudin-Schotte, M.; Bisschoff, M.; Joosten, I.; van Keulen, H.; van den Berg, K. J. 2013. Dry cleaning approaches for unvarnished paint surfaces.New Insights into the Cleaning of Paintings.Smithsonian contribution to museum conservation, 209-219.
Palla, F.; Billeci, N.; Mancuso, F.P.; Pellegrino, L.; Lorusso L.C. 2010 Microscopy and molecular biology techniques for the study of biocenosis diversity in semi-confined environments, Conservation Science in Cultural Heritage, 10, 185-194.
Giordano, A.; Casoli, A.; Selva Bonino V.E.. 2014. Il metodo dry cleaning per la pulitura delle opere d'arte: il caso studio delle mensole lignee policrome del castello di Trabia. Progetto Restauro, 68,42-48.
Barresi G.; Di Carlo E.; Trapani M. R.; Parisi M. G.; Chillè C.; Mulè M. F.; Cammarata M.; Palla F. 2015. Marine organisms as source of bioactive molecules applied in restoration projects, Heritage Science, 3, 17.

* Corresponding author: F. Palla franco.palla@unipa.it

RECOVERY OF THE 12TH CENTURY WALL, MADRID (SPAIN), LOCATED IN THE PALACE OF THE MARQUIS OF VILLAFRANCA

Gómez, D.[1]; Gómez, E.[1]; Domínguez, E.[2*]; Gómez, M.B.[3]

[1] Architectural Construction and Technology Department (UPM), Madrid, Spain, [2]Building Structures Department (UPM), Madrid, Spain, [3] Polytechnic High School San Pablo CEU, Madrid, Spain

During the documentary research previous to the rehabilitation of the Palace of the Marquis of Villafranca, there were found some documents that suggested that one of the elements of the foundation walls could have formed part of the Madrid's second wall which, during the 12th century had delimited the city.

To contrast this possibility the positional matching of the element with the wall has been verified and material tests realized. Both confirm that the materials and building typology employed correspond to the expected. The initial dimensions of the studied wall were 14 x 1.70 meters (length by height). Under the hypothesis that the constructive elements attached to it could be hiding a largest slab, we proceeded to perform different surveys that allowed to establish new total dimensions of 18 x 4.50 meters.

The identification of the wall slab has made necessary a profound modification of the project in order to be able to restore it entirely and put it in value. As a result, the horizontal slabs and mortar layers have been demolished and replaced by new ones that do not interfere with the wall slab. The staircase built in the middle of the 20th century that was directly supported to the wall has been eliminated and the installations room that was hiding part of it has been abolished. After releasing the whole item it has been the restored in different phases:

- Cleaning of the vertical faces of the wall.
- Physical-chemical cleaning of the quartzite and silex blocks that form it.
- Consolidation of the original mortar and of the ceramic pieces.
- Replacement of the mortar faults and elimination of inappropriate mortars.
- Application of a patina to the fragments added.

Figure 1. The wall slab before the refurbishment

Figure 2. The wall slab after the refurbishment

*Corresponding author: E. Domínguez edominguez@promec.es

REHABILITATION OF THE RAILWAY VIADUCT OF MADRID IN REDONDELA (PONTEVEDRA, SPAIN)

Gómez, D.[1*]; Gómez, E.[1]; Domínguez, E.[2]; Gómez, M.B.[3]

[1] Architectural Construction and Technology Department (UPM), Madrid, Spain, [2] Building Structures Department (UPM), Madrid, Spain, [3] Polytechnic High School San Pablo CEU, Madrid, Spain

In the cleaning and protection interventions over the Viaduct of Madrid in Redondela, held by the regional government of Galicia (Xunta) between the years 2000 and 2002, a system based on three layers of epoxy-polyurethane resin was employed. Some time after, falling fragments of the metal frame highlighted a process of unusually accelerated deterioration of the viaduct. This process is attributable to the high exposure of the structure (located in the Ria de Vigo) and to the tensions generated between the layers of paint added in the maintenance operations, due to their chemical composition. The constructive typology, by means of rivets and rolled profiles, has also contributed to corrosion on joints. At the same time, the structure design has allowed the accumulation of water in different areas during nearly 150 years, which has provoked a significant loss of the frame section.

To solve all these failures, the General Management of State Assets commissioned a new rehabilitation project for the viaduct to some of the technicians that sign this article. The project has been based on an exhaustive analysis and classification of the pathologies that has lead to the identification of more than that 5,000 types of damage in the metal frame of the viaduct. The repair of these pathologies has involved the replacement of 20% of the structural elements, including sliding bearings. The overall treatment of the metallic elements has been carefully realized, in order to maximize their life expectancy (> 15 years) in a C5 I environment according to the standard ISO 12 944-5.

For the surface preparation, the use of blasted grit was limited due to the high amount of residue that it would generate and because of the presence of contaminant pigments in its composition - lead mining, strontium chroming and zinc chroming among others -. For this reason, a hydro- jetting technique was employed. The sliding scaffolding used during the process included a filtering system of the water collected during the treatment.

The protection system chosen is compounded by four layers with a total thickness of 300 microns. They have the following features:
- 1st layer: two-component 70 microns thick liquid prime with an epoxy base.
- 2nd layer: two-component 55 microns thick liquid paint with an epoxy base.
- 3rd layer: two-component 125 microns thick liquid paint with an epoxy base.
- 4th layer: 50 microns thick liquid paint (polyol acrylic).

In order to ensure the desired durability, it was paid special attention to the execution quality control. Humidity and temperature conditions for the application of the different layers were verified and a broad program of trials related to different aspects was established.

Asociación Española de Normalización y Certificación, 2008. UNE-EN ISO 12944-5: pinturas y barnices : protección de estructuras de acero frente a la corrosión mediante sistemas de pintura protectores. AENOR.

* Corresponding author: D. Gómez david.gomez@upm.es

ASILAH ARTS FESTIVAL (MOROCCO): THE CITY AS A STAGE AND THE REDISCOVERY OF THE EVERYDAY LIFE

Gómez López, M.[1,2]

[1] Complutense University of Madrid, Spain; [2] SOAS University of London, UK

The origins of the Asilah Arts Festival can be traced back to 1978, some years after the journalist and politician Mohamed Benaïssa and the artist Mohamed Melehi, came back to their hometown and found it poorly preserved. The two friends mobilized the population and the Town's Council to remodel and preserve the external appearance of the village and its historical buildings, an activity mostly accomplished by local craftsmen using ancient methods, forms and materials. The rehabilitation project, which aimed to be coherent with the original image of the town and its History, was awarded with the Aga Khan Award of Architecture in 1989.

In 1978, Melehi and Benaïssa organized an event under the slogan "Culture and Art for Development", in which a group of international artists were invited to paint the towns' walls in collaboration with the inhabitants. The first edition of the Festival had then been informally launched, a tradition that has been perpetuated until our days, lastly becoming part of the village's patrimony. Today, the event includes an extensive program of conferences, workshops, concerts, exhibitions, recitals or urban interventions that annually turns the small village into a lively scenery for the international and local, tradition and modernity dialogue.

During two weeks, the Festival coexists with the everyday life of the town and its own parallel artistic activities, sometimes even taken as part of the event and thus, blurring the boundaries between the prepared ephemeral stage and the always present arena of the quotidian. The ordinary life is somehow unconsciously unveiled and surprisingly revealed as extraordinary as the event itself, the Festival turning out to be an access gate to the intimate existence of the enchanting town.

The Asilah Arts Festival, born as part of an urban and architectural heritage preservative enterprise, has today become itself a rooted element of the town's patrimony. Its annual celebration has raised a permanent awareness of the medina's maintenance, temporary stage of the Festival, and the optimum preservation of its urban and architectural ensemble. Furthermore, the event has contributed to the survival and diffusion of national, and especially local, material and immaterial legacy, including crafts, traditional music or contemporary artistic production, they being performed either as part of the event or besides it. For these reasons, the event could be undoubtedly considered as a heritage festival that, not only preserves and promotes, but also celebrates Asilah's architecture, art and life.

This proposal aims to present the Asilah Arts Festival as an interactive platform for international and local cultural interchange but especially, as the essential preservative source in an urban, customary and artistic way it is. The conference will look beyond the staged projects to delve into the backstage, where the everyday life of the fishing town, as remarkable as the event itself, follows its course. Given the scarce publications on this, it has been considered relevant to set out an in-depth reflection for this 5th Youth Conservation of Cultural Heritage International Conference.

* Corresponding author: M.Gómez mgl9245@gmail.com

ADVANCES IN SERS: DEVISING CONTEMPORARY ART MATERIALS INVESTIGATION TOOLS

Gómez, M.; Lazzari, M.; Reggio, D.*

Centre for Research in Biological Chemistry and Molecular Materials (CIQUS), University of Santiago de Compostela, Santiago de Compostela, Spain

This work presents Surface Enhanced Raman Spectroscopy (SERS) applications for the detection of early weathering products on organic cultural heritage materials. Preliminary results about the use of SERS-active nanostructured substrates for the detection of low-concentration analytes are presented. These devices enable to investigate surface products and minimize the amount of material to be sampled.

Compared to traditional Raman spectroscopy, SERS allows to locally amplifying low-intensity signals; therefore, smaller amounts of molecular structures can be detected. An electromagnetic field generated by plasma excitations enhances the signal through appropriate nanoparticles or nanostructured metals. Our challenge is to device high performance SERS-active substrates suitable for *in situ* extractions of materials without any fragment removal. This will expand the versatility of SERS applications already in use heritage science research.

Our preliminary results have shown to be successful. We sampled low-molecular weight degradation products from the surface of reference materials (e.g. linseed oil, or common plastic materials) through a 'sticky' silicone elastomeric soft cast mould. The analyte molecules were transferred to the nanostructured SERS substrate by rinsing it with a small amount of appropriate solvent, and then collecting the Raman spectrum.

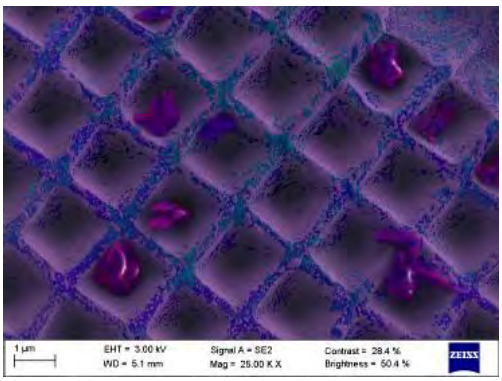


Figure 1: SEM images of a mould replica (scale bar = 1 µm) in false colour.

Gómez, M., Lazzari, M., 2012. PFPE-based materials for the fabrication of micro- and nano-optical components. Microelectronic Engineering. 97 208–211

EU-Horizon 2020 project: "NANOmaterials for the REStoration of works of ART" (NANORESTART)

*Corresponding author: D. Reggio daniela.reggio@usc.es

INTERCULTURALITY AND MUSEUMS OF ANTHROPOLOGY

Gómez-Plácito, C.*

University of Sevilla, Madrid, Spain

The concept of cultural heritage has advanced in content and intentions. Now, it is not only about protecting and preserving those monuments and goods of great beauty and history, but also, about safeguarding and promoting knowledge, rituals, traditions, gastronomy... Multiple cultural elements that connect us with our local identity in this increasingly globalized world.

It is as important that people know, learn and value their own heritage as the one that could seem strange and distant to them. It contributes to the understanding of the difference and, then, encourage the tolerant attitudes. In this sense, anthropological museums are spaces that can bring visitors to the multicultural reality by revealing the different communities' heritage and by promoting curiosity and reflection about human beings.

The main issue I would like to expose here it is the important role of anthropological museums in promoting multicultural values from a theoretical and practical perspective. That is, taking into account the main factors and current conditions of the particular context that affect them nowadays, as its social projection.

This reflection is based on a final project for the *Masters in Anthropology: Management of Cultural Diversity, Heritage and Development* of the University of Seville. It is a qualitative study whose unit of analysis is the National Museum of Anthropology in Madrid and includes techniques as bibliographical review, field observations and interviews with different kind of visitors and museum professionals. Currently it is still in development, but aims to finish within the next two months at most and aspires to circulate freely its results.

*Corresponding author: C. Gómez-Plácito claragomezp@gmail.com

NEW VISIONS FOR CONSERVATION IN MEXICO. CASE STUDY EXHACIENDA SAN DIEGO DEL JARAL

González-Franco, A.[1,3*], Muñoz, R.[2,3]

[1]Independent consultant, [2]Ministry of Finance, Mexico City, [3]Universidad Autónoma Metropolitana, Mexico City, Mexico

Although there are different strategies for conservation, which had its origins on the "monumental" perspective founded on the restoration as the methodological approach, but in the present century there are new proposals. The reuse of the edified preexistence based on management plans presents itself as an integrated strategy, where it converges conservation, social welfare, environmental and economical sustainability, by giving relevance to the existing architecture located in the different urban environments regardless if it's a "monument" or minor architecture.

Through the reuse of any edified preexistence it can be ensured environmental and economical sustainability by reducing the energy costs through the management of human and material resources. The reuse of the edified preexistence it's by itself a conservation strategy and a design practice that aims to satisfy human needs, as well as the current urban and architectural requirements by the implementation of contemporary knowledge and technologies on previously built environments.

Therefore, the reuse also allows the reaffirmation of the identity and collective memory of a society, which is reflected in their edified preexistences by assigning them a continuity of use. In addition, also supports to the cultural enrichment through the integration of new architectural programs and forms hat coexist and complement the edified heritage.

The case study of the Exhacienda San Diego del Jaral it's an example of the current conservation problem in Mexico: a vast amount of edified heritage that due the lack of human and financial resources are abandoned. The deficient territorial planning, in which are not included new schemes of economic investment, are the main challenge to be addressed in the country over the next few years, where they should overcome the paradigm of the vision of the heritage as public expenditures and move it to a profitable model for economic development.

* Corresponding author: A. González-Franco angiegofra@hotmail.com

LOCAL PERCEPTIONS OF CULTURAL HERITAGE AND TOURISM DEVELOPMENT

Gunjić, L.*

Graduated tourismology, master manager- culture and media, Belgrade, Serbia

This paper represents a part of the wider research of case study Bač, a small town in the north-west of Serbia, put on the UNESCO's Tentative List.

The aim was to explore if cultural heritage in Bač can be the driving force for development of cultural tourism and in that way be an engine of local community development. The semi-structural interviews were conducted with representatives of local community and local actors. Research questions which will be addressed in this paper are: What are the attitudes of locals towards tourism industry? Is the attractiveness of the Bač Fortress and the Franciscan monastery a sufficient motive for the local community involvement to provide complementary services to tourists? It was important to see if such value and potential of cultural heritage was recognized by the local community, since the residents are significant actors who can influence the success or failure of the local tourism industry.

The results implied the absence of local initiative and their involvement in the development of tourism as consequence of: (1) dissatisfaction with the level of organization, (2) insufficient tangible results of tourism development, (3) expectation of local authorities to address and solve the problems, (4) perceptions that costs prevail the benefits, (5) lack of knowledge and education in terms of possible gain of tourism and how they can be involved in such activities. Although the local community is aware of significance and attractiveness of cultural heritage, it does not recognize cultural heritage in a more beneficial way, as an economic resource.

* Corresponding author: L. Gunjić lanagunjic@gmail.com

CONSERVATION LIVING WITH ARCHAEOLOGY: THE EXAMPLE OF SAROUQ AL HADID, DUBAI (E.A.U.)

Gutiérrez, L.[1*]; Monreal, A.[1]; Boraik, M.[2]

[1] Conservator, Madrid, Spain, [2] Head of Archaeologist in Sarouq Al Hadid, Dubai, United Arab Emirates

Sarouq Al Hadid is an extraordinary archaeological site located in the desert of Dubai, United Arab Emirates, with a chronology between III Millennium B.C. and I Millennium B.C. The meaning of Sarouq al Hadid in Arabic is “mountain of iron” and this is an important clue in understanding the type of activities that were developed in this area and the objects that are going to be found. There are ceramics, soft stone vessels, and wonderful necklaces, but objects made from iron and copper alloys are the most abundant. Excavations have revealed thousands of copper and iron objects such swords, daggers, axes, arrowheads, snakes and other figurines.

In order to excavate this extraordinary site, it has been developed a multi-disciplinary program for the excavation of Sarouq al Hadid, with archaeologists, conservators and many other specialists working side-by- side both on the excavation, and in the onsite laboratory. The laboratory was simple but supplied with everything needed for the urgent treatments on the objects that came from the site at the first moments. Thanks to collaboration between Dubai Municipality and the conservation team placed in Sarouq al Hadid, there has been developed a more equipped laboratory where it was possible to face more complex corrosion problems, especially on archaeological metal objects. On the occasion of a future exhibition about Sarouq in Dubai in 2016, there have been treated 38 archaeological objects made of iron and copper alloys.

All the objects were extracted in ancient diggings in Sarouq al Hadid by several missions, and are, of course, related with the site. Some of the important objects are iron swords, iron and copper decorated daggers, and other copper alloy objects such as swords, daggers, knives, axes, bowls, arrowheads, bracelets, plates or rings. After restoration treatments, there has been recovered not only the stability and the shape of these relevant artifacts, but also a lot of hidden information such as decoration that had been a useful information for a better understanding of the site and the society that was occupying this area three thousand years ago.

The work developed by conservation team in this season has been focused on solving serious corrosion problems on these objects with the minimal intervention. Always following the latest recommendations about Conservation from the international organizations specialized in metal conservation, and always with a live dialogue between conservators, archaeologists and other experts that were working at that moment in the site.

* Corresponding author: L. Gutierrez laluchi23@gmail.com

ANALYSIS OF STAKEHOLDER PATENTING AS A WAY TO SAFEGUARD CHINESE HERBAL MEDICINE

Han, Z.; Imon S.S.*

Institute for Tourism Studies, Macao, China

Knowledge and practices concerning nature and the universe is one of five domains of intangible cultural heritage (ICH) identified by UNESCO. Traditional medicinal practices occupy a significant part of this domain. Despite its significant role in providing preventive and curative services to many communities around the world, traditional medicine is not receiving enough attention from the public and thus facing the danger of disappearance.

By looking at the Traditional Chinese Herbal Medicine (TCHM) from an ICH perspective, this paper focuses on the issues related to the safeguarding of TCHM. In particular, of the four common approaches used to protect TCHM – Stakeholder Patenting, Digital Capture of Traditional Medicines, Disclosure of Origins and Geographical Indications Enshrinement, and Local Community-based Innovation Database – this paper investigates the usefulness of Stakeholder Patenting, the most common method employed in China, as a method for safeguarding TCHM.

The research, using an exploratory case study method, consisted of in-depth interviews with practitioners and professionals involved in TCHM. It also carries out a documentary research of important documents related to TCHM and the patenting of it. The study revealed that Stakeholder Patenting can make significant contributions towards the safeguarding of TCHM. However, this method alone is not sufficient and that a more comprehensive system combining other methods is necessary for its long-term sustainability.

* Corresponding author: S.S. Imon imon@ift.edu.mo

MÚCARA STONE AS A BUILDING SYSTEM AT THE PORT OF VERACRUZ, MEXICO

Hernández Hernández, A.I.*

UNAM, Mexico City, México

Scleractinian corals, the main elements of the reefs of their kind, are part of the marine fauna that is characterized by a calcium carbonate exoskeleton. These exoskeletons, in the form of block and which are named "*MÚCARA* STONE", have been used throughout the centuries for building New Spanish style buildings. In Mexico, the first to mention the use of *Múcara* stone, of Madreporic origin and for constructing buildings in the port of Veracruz, was Alexander Von Humboldt in his Political Essay on New Spain. Downtown buildings and buildings as the Bastions of Santiago, the Fortress of San Juan de Ulúa and the Old Jesuit College, were built with such material.

Located on the perimeter of the Historic Center of Veracruz, near La Gallega reef, the heritage buildings above mentioned are just a few examples of colonial architecture of the seventeenth to nineteenth centuries, which have been studied in order to know the properties of the *Múcara* stone as a construction system (Mixed masonry) in the heritage buildings that shape the port's old tracing.

The methodology used to inspect the buildings walls in order to determine the Scleractinian corals species used as *Múcara* stone for construction in situ, was making several trips, as well as shooting a photographic studio of the species to qualitatively estimate which of them were more frequently used. In the reefs belonging to SAV, two species of Diploria, D. strigosa and D. clivosa, have been registered; for this reason, it is very likely that both of them had been used for constructing these buildings, but given the deterioration of the rocks, it was impossible to determine the specimens at the species level.

Finally, it is appropriate to mention that from the twenty-nine species of Scleractinian corals recorded at the Veracruz Reef System, ten are those that form mass exoskeletons, and therefore, they are likely to be used as *Múcara* stone for constructing buildings based on masonries, which, along with the annealed clay, conform mixed structures with a high capacity of loads transfer.

Hernández Hernández Alberto Isaac. 2016. Múcara Stone as a Building System at the Port of Veracruz.

* Corresponding author: A. Hernández albertoihdz@gmail.com

A MICRO-RAMAN CHARACTERIZATION OF PAINTING MATERIALS PRESENT IN TEMPERA PAINT DOSIMETERS AND CRITICAL APPRAISAL

Herrera, A.[1*]; Ocero, M. [1]; Rodríguez-Simón, L.[2]; Navas, N.[3]; Cardell, C.[1]

[1] Dept. of Mineralogy and Petrology, Faculty of Science, University of Granada Granada, Spain, [2] Dept. of Paint and Restoration, Faculty of Fine Arts, University of Granada, Granada, Spain, [3] Dept. Analytical Chemistry, and Biomedical Research Institute of Granada (IBIG) University of Granada, Granada, Spain

Recent researches in the field of painting heritage are focused on the analysis of the deterioration of outdoor paint artworks due to polluted urban atmospheres, which pose a significant problem to the aesthetic appearance. In this context, studies are conducted on paint dosimeters (model samples elaborated following medieval artists' recipes) for the purpose of preserving historic paintings (Herrera et al., 2016). In any case, a full characterization of the painting materials is required. Hence to have databases of various techniques to typify them is of great importance. Among the most commonly used techniques are X-ray diffraction, Raman spectroscopy or FTIR spectroscopy (Mateos et al., 2015).

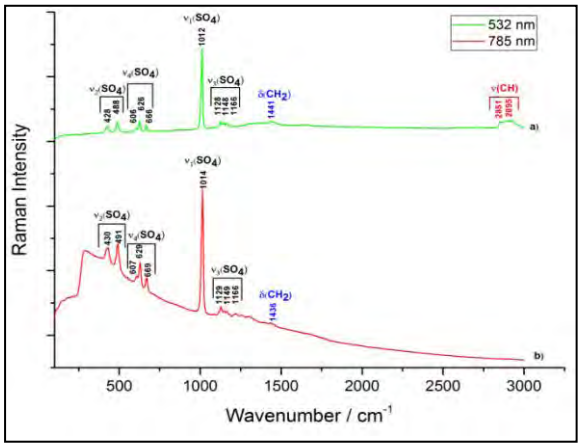


Figure 1: Raman spectra of bassenite-based egg yolk measured with two different laser excitations: a) 535 nm and b) 785 nm

The aim of this work was to create a Raman database with selected pigments (lapis lazuli, malachite, lead white, hematite, azurite, cinnabar, gypsum, calcite and azurite) and binders (rabbit glue and egg yolk), blended in binary mixtures and spread on glass slides as paint dosimeters. These were analyzed with Raman spectroscopy (RS) using 535 and 785 nm laser excitations. Results showed the need to apply both laser excitations for a full characterization of pigments and binders and their interferences/changes. In addition, we did x-ray diffraction (XRD) analyses which supported the RS results. In some cases the commercial pigment compositions did not correspond to our RS and XRD analytical data. Furthermore, we found that some pigments changed their composition when mixed with the binder. For example, gypsum ($CaSO_4{\cdot}2H_20$) with crystal size < 75μm underwent dehydration and transformed into bassenite ($CaSO_4{\cdot}0.5H_20$) when mixed with egg yolk. Thus, we suggest that lipids and proteins from egg yolk act as drying agents.

Herrera, A.; Navas, N.; Cardell, C., 2016. An evaluation of the impact of urban air pollution on paint dosimeters by tracking changes in the lipid MALDI-TOF mass spectra profile, Talanta. 144, 53-61. Mateos, L.D.; Cosano, D., Mora, M., Muñiz, I., Carmona, R., Jiménez-Sanchidrián, C., 2015. Raman microspectroscopic analysis of decorative pigments from the Roman villa of El Ruedo (Almedinilla, Spain), Spectrochim. Acta Part A Mol. Biomol. Spectrosc. 151, 16–21.

Andalussian Research Groups RNM-179, Spanish Research Projects AERIMPACT (CGL2012-30729) and EXPOAIR (P12-FQM-1889) for financial support.

* Corresponding author: A. Herrera jaherrera@ugr.es

THE ROYAL SITES AS A TOOL FOR THE EDUCATION OF NEW GENERATIONS: THE CASE OF EL PARDO (MADRID, SPAIN)

Hortal Muñoz, J.E.*; Labrador Arroyo, F.; Versteegen, G.; Walliser Martín, L.

Department of Educational Sciences, Language, Culture and Arts, Historical, Legal and Humanistic Sciences and Modern Language, Faculty of Law and Social Sciences, Universidad Rey Juan Carlos, Madrid, Spain

At the Universidad Rey Juan Carlos, we are developing the project "The heritage of the Royal Sites", a project which aims transmitting to society, through formal and informal education, a historical, biological and cultural European heritage of the first order. The project proposes to enjoy, learn about and preserve the Royal Sites, through the use of innovative technologies and their environmental sustainable and social responsible exploitation exploring the constitution of a European citizenry as political expression of democracy. The Royal Sites were complex spaces of an enormous value, consisting of woods, gardens, agricultural spaces, factories, urban centres and palaces. An example of these Royal Sites is the green heart of Madrid, the forest of El Pardo, which is a former hunting ground of a Royal Site, a testimony of a historical landscape, a place in which the original flora and fauna are preserved. We also can find there the urban centre El Pardo, integrated in this natural space and a royal residence, the Palace of El Pardo, where an important architectonic and artistic complex is conserved.

On the level of primary and secondary education the economic, social and cultural importance of the Royal Sites in European culture and history is barely treated. As mentioned in the Report of the Horizon 2020 Expert Group on Cultural Heritage *Getting cultural heritage to work for Europe* as well as in the *Conclusions of the Council of the European Union, (Education, Youth, Culture and Sport)*, adopted on 20 May 2014, improved cultural education can foster greater unity and cohesion of European citizens, and a better understanding of Europe's cultures and their interaction with non-European cultures and societies improves inter-cultural dialogue and mutual understanding. The Royal Sites are in both senses interesting, as they shaped European culture and also, as cosmopolite centres of science and culture, spread knowledge about and coming from other American, African and Asian cultures over Europe. Focusing on the Royal Site El Pardo, our project will offer a set of proposals to educational institutions regarding the promotion of European cultural heritage in relation to the education in values, such as solidarity, mutual understanding, (gender) equality and the importance of environmental sustainability. This way, the project will promote educational and teaching methods which aim to teach living together through the knowledge of a common European history, without national prejudices, knowing differences and similarities, so as to reach a democratic society.

* Corresponding author: J.E. Hortal Muñoz joseeloy.hortal@urjc.es

THE PALETTE OF A XVI CENTURY VENETIAN ARTIST: MATERIALS AND METHODS OF GIOVANNI DA MEL

Impallaria, A.[1,2,3*]; Tisato, F.[1,3]; Petrucci, F.[1,2,3]; Dal Colle, M.[4]; Ruggio, E.[5]

[1]Dep. of Physics and Earth Science, University of Ferrara, Italy, [2]INFN, Ferrara, Italy, [3]TekneHub, Ferrara, Italy, [4] Dep. of Chemistry, University of Ferrara, Ferrara, Italy, [5]Restoration atelier "La conservazione dell'arte", Vittorio Veneto (TV), Italy

Giovanni da Mel (ca. 1480 - 1549) was an Italian Renaissance artist, who worked in the region of Veneto and was devoted to the *fresco* technique in his family workshop (Claut,1999). In his later years, he painted the altarpiece (Figure 1) for the church of Trichiana, in the Prealps of Belluno (Veneto).

Figure 1. Giovanni da Mel, Trichiana altarpiece, 1543, oil on canvas, 238x176 cm, Trichiana (Italy)

This painting is the only one on canvas acknowledged by the artist. For this reason, the main question arisen by the art historians was if he simply employed the *fresco* materials and related methodologies, or if he adopted any variation.

Thanks to the collaboration between restorers and scientists, it has been possible to deeply study this peculiar painting. Many diagnostic techniques, most of them non-invasive, has been used in order to characterize the altarpiece for art materials.

Starting from the imaging techniques (i.e. raking light, UV fluorescence, IR reflectography and X-ray radiography), passing through the point ones, such as X-ray fluorescence and spectrophotometry, many information have been obtained, regarding not only the material used, but also the conservative state and the history of the painting. All these measurements have been performed *in-situ* by means of portable instruments.

When the non-invasive techniques were not sufficient for a comprehensive analysis, 12 small samples were taken and analyzed under optical and electronic microscopy (SEM). Furthermore, some of them have been analyzed with microchemical tests in order to identify binders. Results of the analysis on this painting and their comparison with some frescoes of the Da Mel's workshop, show both differences and affinities in the art technique.

The diagnostic protocol was authorized by the Diocese of Vittorio Veneto, owner of the painting, and by the Soprintendenza per i Beni Architettonici e Paesaggistivi per le province di Venezia Belluno Padova e Treviso, responsible for the protection. Authors gratefully acknowledge collaboration and availability of these institutions.

Claut, S; 1999. Da Mel Giovanni, in La pittura nel Veneto. Il Cinquecento, edited by Lucco, M., 3, 1283.

* Corresponding author: A. Impallaria anna.impallaria@unife.it

DEFINING A MICRO-NICHE OF CULTURAL TOURISM: FESTIVAL & EVENT TOURISM AND EXPLORATION OF ITS INFLUENCE ON SOCIOECONOMIC LIFE IN TRINIDAD AND TOBAGO

Ismayilova, U.*

Baku Public School, Baku, Azerbaijan

In the past, visitors traveled to various countries, close or far, for various motivations and reasons, such as pilgrimages, wars, invasions, trades etc. However, nowadays, we are observing something that is not overwhelmingly existent in the past as it is today. This tendency consists of the fact that tourism is becoming increasingly interlocked and tightly connected with the idea of culture and heritage of both originating and hosting destinations. This notion is called “Cultural Tourism”. It involves leisure travel for the purpose of seeing or experiencing the unique character of a destination, its people, and its cultural products or heritage (Richards, 2003).

As cultural tourism is frequently quoted as being one of the largest and fastest growing segments of global tourism, responsible for influencing approximately 40% of global international trips a lot of organisations state that empirical research has to be done in the sphere to better identify social issues and future perspectives in this new market. Since this type of tourism has sparked far-reaching changes in the entire scope and organisation of the tourism industry worldwide, comprehensive research is essential to prevent possible negative influence of tourism on cultural heritage of tourism destinations, which previous experiences demonstrate that in most cases it can be detrimental and unrecoverable.

Additionally, in such a dynamic and competitive industry, countries and destinations enthusiastically seek strategies and research to attract more tourists by sustainable utilisation of culture and enhancement of cultural tourism experiences. It has been found that most of local communities also agree that cultural and heritage tourism can be successfully used as a tool to boost local economy.

This research is focusing on the subcategory of cultural tourism - Festival and event tourism, by exploring the definitions, its lifecycle and advantages that it can bring to the destination within the framework of strict control and analysis. In the case of carnival in Trinidad, it has been found that, Festival and Events Tourism in fact generated remarkable benefits to the island from economic, social, cultural and environmental perspectives. However, it is also been uncovered that the issues of sustainability, and change of visitor’s motivations and needs within this dynamic industry, need constant rejuvenation in order to stay competitive and relevant.

* Corresponding author: U. Ismayilova ulyana1981@yahoo.com

INVOLVEMENT OF AZERBAIJANI YOUTH IN STUDY, PRESERVATION AND PROMOTION OF HISTORICAL AND ARCHITECTURAL MONUMENTS

Jabiyev, G.[1]; Khalilli, F.[2*]; Bayramova, S.[3]

[1]National Academy of Sciences of Azerbaijan, Baku, Azerbaijan, [2]MIRAS Social Organization in Support of Studying of Cultural Heritage, Agsu, Azerbaijan, [3]MIRAS Social Organization in Support of Studying of Cultural Heritage, Baku, Azerbaijan

During the past few years, young people's interest in preservation and promotion of historical and cultural heritage in Azerbaijan has increased as a result of the new government policy towards the related professions. The number of people interested in a career in archaeology, ethnography, architecture and art is growing, confirming this trend.

Non-governmental Organisations have also played an important role in involving young generations in the study, preservation and promotion of cultural heritage. In this regard, several successful cultural heritage projects undertaken by Heydar Aliyev Foundation, MIRAS Social Organization in Support of Studying of Cultural Heritage, SEBA (Seoul-Baku) Azerbaijan-Korean Cultural Exchange Association Public Union, the Regional Development Public Union, Ireli Public Union and Azerbaijan Student Youth Organizations' Union (ASYOU) can be cited. The conservation work carried out in medieval cities such as Agsu, Shamkir and Gabala is another example of how young people have developed their theoretical knowledge and practical training.

However, despite the efforts most of the main positions in universities and research centres in Azerbaijan are still managed by old and conservative-minded people. In addition to this, the lack of a specific education in the field of cultural heritage conservation and of training opportunities for young students and young researchers represent a barrier to developments in the field. For this reasons, international collaborations and exchanges among experts are essential in order to reduce the gap between Azerbaijan and European countries and help and promote the development of a strong local institution.

The work of MIRAS Social Organization together with YOCOCU (Youth in Conservation of Cultural Heritage) have been extremely important in this respect. The organisation of seminars, conferences and courses have given students the opportunity to acquired new skills thanks to the collaboration with international experts who shared their knowledge about modern technologies and new techniques. The 2015-16 campaign with local bachelor and master students working on the conservation of archaeological monuments in Agsu under the supervision of specialists from YOCOCU is a clear evidence of the importance and efficacy of an international approach.

*Corresponding author: F. Khalilli farizkhalilli@gmail.com

STUDY ON CORROSION MECHANISM IN SOME ARCHAEOLOGICAL IRON OBJECTS FROM NORTHERN IRAN

Jafari, A.[1]; Oudbashi, O.[2*]; Abedini Araqi, M.[3]

[1] Art University of Isfahan, Isfahan, Iran, [2] Art University of Isfahan, Isfahan, Iran, [3]ICHTO of Mazandaran Province, Sari, Iran.

Characterization of chemical and microscopic features of corrosion layers covering archaeological metal artefacts is the important subject to understand conservation conditions of the excavated metal collections and help conservators to prepare a conservation strategy for long term preservation of archaeological objects. It is proved that many archaeological iron objects were found from different archaeological excavations that form various collections in museums worldwide. Iran is one of the important regions in the history of ancient metallurgy and many metallic collections have been found from Iranian archaeological sites from different periods. In this paper, a study on the corrosion layers and products in a number of iron artefacts was established to identify corrosion morphology and mechanism in these objects.

The iron objects excavated at two archaeological sites in Savadkouh region, Mazandaran, northern Iran: *Lafoorak*, the Iron Age cemetery (first half of first millennium BC) and *Pahlooj*, the Sasanian cemetery (ca. mid of first millennium AD). The iron objects are now maintained in Kolbadi museum of Sari, Mazandaran, northern Iran. For this purpose, eight iron objects were investigated in this research. The corrosion morphology and mechanism in eight iron samples from two sites were examined by Optical Microscopy observations as well as Scanning Electron Microscopy-Energy Dispersive X-ray Spectroscopy (SEM-EDS) and X-ray Diffraction (XRD) analytical methods. The results showed that some objects are corroded completely while in some other objects, a thin corrosion crust has formed on the surface of iron. The corrosion crust observed in the samples shows a multiple layer structure that may be formed due to changes occurred during burial time as well as post-excavation conditions.

The main corrosion products are consisting of different iron oxides and hydroxides. In fact, the corrosion morphology and mechanism of the iron objects of *Pahlooj* and *Lafoorak* archaeological sites is due to long-term burial in moderately corrosive soils. Some preventive conservation recommendations were proposed to preserve two iron collections to reduce deterioration in the objects in post-excavation environment.

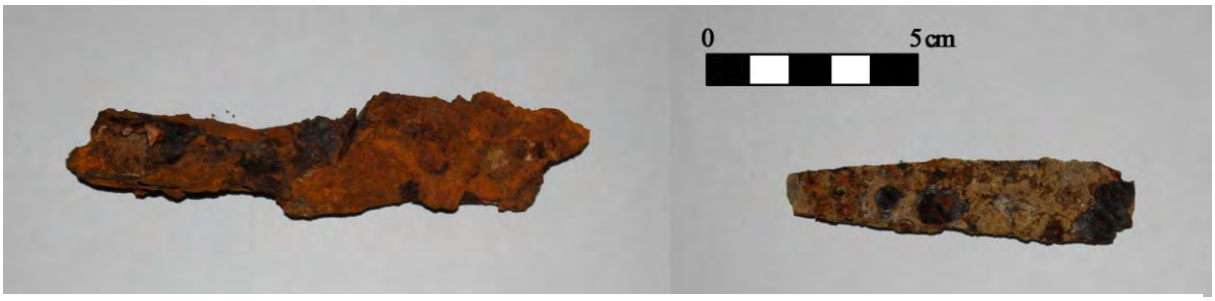


Figure 1. Two iron objects from northern Iran, left: Spearhead from Lafoorak, right: blade from Pahlooj

* Corresponding author: O. Oudbashi o.oudbashi@aui.ac.ir

CONSERVATION OF WEAPONS - RESTORATION OF MISSING PARTS

Jovanovic, D.*

Central Institute for Conservation in Belgrade, Belgrade, Serbia

Conservation of weapons is a specific field of conservation due to the complexity of the material from which weapons are made (composite materials - organic and inorganic materials), but also because of understanding of the weapons as musealia . In the past interventions on weapons were made with the aim of restoring the function of weapons or were performed in the goal of maintenance (craft repairs due to which parts of the objects were changed, fixed etc.). Modern approach to conservation, which involves the use of methods and materials in the process of conservation that does not affect the aesthetic and historical value of the object and does not change the physical and chemical properties of museum objects, encourages the use of modern materials in the process of reconstruction. This paper will present different types of materials used for the restoration of the missing parts of the weapons from the period of the 18th and 19th centuries.

Conservation and restoration treatments presented in this paper were performed on the museum objects with a great museum significance, since that they are representatives of a particular typology which is illustrated with a small number of preserved specimens (objects) in Serbia. Physical damage of the organic materials on presented museum objects, in the form of lacunae and missing parts of the objects, was caused by insects or inadequate climate conditions. The main goal of presented restoration treatment was to improve appearance of objects since that their esthetic value was disrupted due to the effects of different factors of decay and also with the aim to prevent their further deterioration. Materials that are reversible and compatible with the original material were used for restoration. Depending on the type of the damage different materials were used for the restoration of parts of this museum objects - Miliput, acrylic putty, glass microspheres mixed with Paraloid B72 or epoxy resin.

* Corresponding author: D. Jovanovic art.artefacts@gmail.com

HERBARIUM CONSERVATION: CATALOGUING PROJECT AND DIAGNOSIS OF CONSERVATION STATUS OF A HISTORICAL COLLECTION OF THE HERBARIUM OF THE UNIVERSITY OF SEVILLE

Juan Muñoz, S.*

University of Seville, Seville, Spain

Natural heritage is perhaps the first type of heritage that mankind has preserved since ancient times. From the very first time that man took a flower in his hands and kept it, it began to take shape the primitive idea of herbarium which would be carried out thousands of years later.

Plant storage and its conservation are written in the domains of herbarium with the need to study and classify them. Storing them in their living state would be very large and the way the botanists preserve them over time involves drying and pressing them to take up less space as possible. It is in this container where the floristic heritage of each country is rescued and preserved, and thus safeguarding those endangered species.

The Herbarium collection of the University of Seville has a small historical collection presented in this dossier. This collection belongs to the old Natural History cabinet founded in 1850 by Antonio Machado & Núñez, grandfather of poets, Antonio and Manuel Machado.

This project focuses on the cataloguing of around 100 botanical pieces presented in wooden boards or embedded in glass tubes and accompanied with a descriptive label.

A detailed diagnosisof pathologies presented in the support, the specimen and labeling has a lso been made. The title of this cataloguing is “Cataloguing of the exhibition collection of lichens, fungi, bryophytes, pteridophytes and some structures of upper floors of the Historic Herbarium of the University of Seville”. The objectives of this work focused on rescuing a forgotten historical collection and the enhancement of such scientific collections. To sum up, emphasizing the need to value the university collections is another goal of this project, since universities are the source of formation of societies.

Figure 1. Piece cataloging number 034HUS

* Corresponding author: S. Juan Muñoz sofi_pan13@hotmail.com

MUNDANE BEAUTY IN CONTEMPORARY ART

Juarranz, A.*

Madrid Polytechnic University, Madrid, Spain

In the 20th century a specific kind of spatial sense emerged from Art: the increased value of mundane beauty. Artistic experiences show that dirt and cleaning have an aesthetic significance. But Architecture does not pay any attention to this field. What is more, it tries to deny it. Nor the design process nor the architectural photography shows the presence of mundane things. Fortunately, artistic works teach us about the secret beauty of dust. Man Ray's *Élevage de Poussière* and Lewis Baltz's walls are fascinating, but also the Wolfgang Tillmans and Stephen Shore's quotidian objects. On the other hand, inseparable from dust, the Pieter Janssens Elinga's classical paintings or the Jeff Wall's contemporary shots present the important purpose of cleaning. By considering the visual and spatial value of these situations, we reconsider this as an experimental space. So, how can we learn from contemporary art to get over this denial?

It is important to dig into the work of these artists. Wolfgang Tillmans' pictures are distinguished by the observation of surroundings like the ordinary domestic scenes. *If One Thing Matters, Everything Matters*' series (2003) shows the inherent attractiveness of common conditions. Tillmans explores a creative equilibrium between two supposedly contradictory practices: unmanned ways of looking at the world and virtuoso compositions. Tillmans has posed deeply intelligent questions about spatial conditions while making pictures of unconventional beauty. About the cleaning matter, and in relation to the formal rigor of Ludwig Mies van der Rohe and his contemporaries, Jeff Wall emphasizes the scrupulous maintenance that these pieces require.

For example, his picture *Morning Cleaning* (1999) shows the interior of the iconic German Pavilion designed for the Barcelona International Exhibition in 1929. Apparently, Mies planned every detail: the clear distinction of structural elements, the free plan, the sumptuous materials, their quartering, the furniture and so on. In the image, a cleaner breaks the solemnity of photography. He prepares the cleaning tools while the extended soap on glass partially clouds the view of the pond. It is a daily activity. It is displayed in their own environment. However, despite the artistic consequences and the veracity of the situation, the mundane layer rarely appears in the public scene. We want to reconsiders the lush beauty of those pictorial images. Architecture should learn from the real experiences that society and contemporary art has been working on.

* Corresponding author: A. Juarranz angelajuarranz@gmail.com

PICTURE WINDOW

Juarranz, A.*

Madrid Polytechnic University, Madrid, Spain

The sculptor and video artist Dan Graham (Urbana, USA, 1942) has intensely worked on the connections and cracks between the spectator and the built and unbuilt space. Since his career began in the mid-sixties, he has been using videos and sculptures to deepen the social codes and the permeability of Architecture. He investigates the links between public and private scale, in particular between the communal environment and the intimate space.

The model *Alteration to a Suburban House* (1987) is the culmination of a long reflection on the American houses. From his point of view, Art and Architecture refer to a social, political and economic context. Therefore, his interest in housing is not casual. For example, *Picture window* (1974) discusses the apparent symmetry established between an interior and an exterior place. The views from one site to another socially define one as "views" of the other. That is, the situation is not reciprocal in both sides of the mirror; seller and customer or boss and employee are not at the same level. What someone on one side of the window can see of the other space, and, what can be seen of them by a viewer on the other side (and, vice versa, for someone on the other side) is conventionalized by the social/architectural code. *Video Projection Outside Home* (1978) is a sculpture where a large screen is placed on the front lawn, facing pedestrians. It shows an image of whatever television program is being watched by the family within the house. Graham reverses the traditional function of TV.

The accurate description of *Alteration to a Suburban House* perfectly describes the performance. The entire facade of a typical suburban house has been removed and replaced by a full sheet of transparent glass. Midway back and parallel to the front glass facade, a mirror divides the house into two areas. The front section is revealed to the public, while the rear, private section is not disclosed. The mirror as it faces the glass facade and the street reflects not only the house's interior but the street and the environment outside the house. The reflected images of the facades of the two houses opposite the cutaway "fill in" the missing facade. The destruction of the main facade provides a new window. However, what Graham looks for has a greater significance. His game changes housing into a showcase of domesticity.

In the context of residential surroundings, *Alteration* might be read simply as an eccentric "do-it-yourself" home modification. It could also be seen as a work of "high" architecture in the modern idiom. There is a liberalizing potential in both cases. Graham aims a change between private and public space. From the approach of the traditional context, the elimination of veracity might look like a risky effort. However, by violating the rules of the classical environment, we can renegotiate the existing conditions. Graham experiments with reality through the model. Rather than considering the reality and model as opposed modes, he uses them at the same level. The model becomes co-producer of reality. The traditional disposition of the family space is altered. The mirror's reflection also exposes the house's relation to the social environment, revealing the position of the spectator's gaze. So *Alteration to a Suburban House* and many Graham's masterpieces are fruitful case studies of an *in between* architecture.

* Corresponding author: A. Juarranz angelajuarranz@gmail.com

USING TRANSFERRED DIGITAL PRINTINGS FOR GILDING VISUAL RE-INTEGRATION: AN APPROACH TO A NEW LOSS FILLING TECHNIQUE

Jutglar Alvaro, N.*

ESCRBCC and Arsus Paper, Barcelona, Spain

Painting's gap re-integration with digital images has been recently tested by illuminating the work of art with a digital projector or using printed images, that can be inserted or transferred. This project describes an attempt to recreate the original appearance of gilding on wood panels using transfers of digital images on Papelgel®. This is a printing material made by Arsus Paper that permits the conservator whether to transport only the inks or to choose the suitable binder film for the transfer.

Several experimental settings have been developed to test a new technique previously used in other fields but never before for gold surface restoration. A wide range of binders mixed with mica, including organic and synthetic, water-based and oil-based, have been first tested on plate gesso and second on recreated oil and water gildings' gaps. Golden surface photographs and digital patterns imitating some abstract re-integration techniques have been printed as models.

The tests demonstrate the compatibility of this technique with both types of gilding and the possibility of improving the results with some color adjustment.

Figure 1 shows an image of the transfer process.

Figure 1. Gilding photograph printed on PapelGel being transferred on wood with gesso

* Corresponding author: N.Jutglar nuria.jutglar@gmail.com

MICA AS A RARE PIGMENT IN PERSIAN WALL PAINTINGS: THE CASE STUDY OF SUKIAS MANSION, ISFAHAN, IRAN

Karimy, A.H.*

Faculty of Conservation, Art University of Isfahan, Isfahan, Iran

White Mica (muscovite or *Talq* as it is called in historic Persian) is a pigment that is mentioned in some old Persian treatises on painting techniques (Seyrafi, 1543. Simi-i-Niyshābūrī, 1433). However, it is found rarely in modern analysis of Persian historic paintings. This pigment is probably used as an additive to white paint in illustration and bookbinding and has been found in a historic painting and a painted book cover (Fitzhugh,1988; Hayez et al., 2004)] but it is absent on the wall paintings analysis.

This paper presents the results of analytical studies on white pigments of wall paintings in Sukias mansion (Isfahan) belonging to 17th century. The equipment used was a scanning electron microscopy coupled with Energy-dispersive X-ray spectroscopy (SEM-EDX) and X ray diffraction (XRD), besides comparing of transparent lamellar shape of samples under polarized light Microscopy (PLM) with known samples (Eastaugh and Walsh, 2004). The main aims are identification of white mica as a pigment and the investigation of some old Persian treatises. Searching for the preparation process of the pigment revealed that different kinds of this pigment have been known for Persian painters (Abū al-Qāsim, 1301. Niyshābūrī, 2004) and the oldest Persian text on the subject belongs to 11th century AD (Ṭabarī, 1093).

Abū al-Qāsim, A. K. 1301. ʿArāʾyis al-Javāhir va Nafāʾyis al-Aṭāʾyib. (Ī. Afshār, Ed.) Tehran: Anjuman-i Āthār-i Millī-i Īrān Press.

Eastaugh, N., Walsh, V. 2004. The Pigment Compendium: Optical Microscopy of Historic Pigments. Oxford: Elsevier and Butterworth-Heinemann.

FitzHugh E.W. 1988. 'Appendix 9: Study of pigments on selected paintings from the Vever collection', ed: G. D. Lowry and M. C. Beach, An annotated and illustrated checklist of the Vever collection, Seattle, 425–32.

Hayez V.,Denoe S., Genadry Z. and Gilbert B. 2004. Identification of pigments on a 16th century Persian manuscript by micro-Raman spectroscopy', Journal of Raman Spectroscopy, 35: 781-785.

Niyshābūrī M.A.J. 2004. Jawāhirnāmih-yi Niẓāmī, eds.Ī. Afshār and M.R. Daryāgasht, Mīras-i Maktūb Press, Tehran.

Seyrafi, 1543, Gulzar-I Safa, in Māyil-Hiravī N. 1993. Kitab-arayi-dar tamaddon I eslami (Book illumination in Islamic civilization), Islamic Research Centre of Āstān-i Qudsi Razavī, Mashhad.

Simi-i- Niyshābūrī, 1433, Risale –ye Jowhariyyeh in Māyil-Hiravī N. 1993. Kitab-arayi-dar tamaddon I eslami (Book illumination in Islamic civilization), Islamic Research Centre of Āstān-i Qudsi Razavī, Mashhad.

Ṭabarī, M. A. ca. 1093. Ṭuḥfat al-Gharāyib. (J. Matīnī, Ed.) Tehran: Kitābkhāna-ye Mūzih va Majlis-i Shurā-ye Islāmī.

* Corresponding author: A.H. Karimy Ahkarimy@gmail.com

BLENDED VISUALIZATION OF X-RAY CT AND 3D OPTICAL SCANNING FOR CULTURAL AND NATURAL HERITAGE

Kostenko, A.[1]*; van Liere, R.[1]; Schulp, A.S.[2]; Renema, W.[2]; Batenburg, K.J.[1]

[1]Centrum Wiskunde & Informatica (CWI), Amsterdam, Netherlands, [2]Naturalis Biodiversity center, Leiden, Netherlands

More than 50.000 museums worldwide take care of collections of artifacts with cultural or historical values and make them available for research, public education and preserve them for future generations. However, among millions of diverse and valuable artifacts, only a small portion is on display for visitors or even accessible to a wide community of researchers. Our aim is to bring the latest 3D imaging technologies and visualization solutions to museums in both the Netherlands and China. Furthermore, we want to enable joint research efforts by allowing the comparison of items among museums. Something that could not be accomplished through a direct physical exchange, due to many restrictions on transport and security.

Such technologies as X-ray CT, 3D laser scanning, photogrammetry and Polynomial Texture Mapping (Payne 2012; Tucci and Bonora 2011) are becoming readily available in many museums around the world, however, they are still not systematically used by the museums. Our current investigation is focused on registration of data acquired by different methods in combination with visualization techniques and virtual reality approaches that can facilitate research efforts and enhance museum visitors' experience and learning. The combination of 3D printing and augmented reality allows us to provide the researcher with an ability to physically hold the copy of an object in hands and to observe its true colour exterior blended with the CT reconstruction of the interior structure through the virtual reality goggles.

Our imaging pipeline consists of a combination of X-ray CT scanning, surface scanning, image registration, real-time visualization and real-time interaction. In this talk, we will cover the various experimental and computational challenges that must be addressed to make all of these components work together in an effective way. We demonstrate the value of collaboration that permits access to and comparison of cultural and natural artifacts across different museums.

Payne E. M., "Imaging Techniques in Conservation", Journal of Conservation and Museum Studies 10 (2012).
Tucci G., Bonora V., "From real to ... 'real'. A review of geomatic and rapid prototyping techniques for solid modeling in cultural heritage field", 3DARCH (2011).

* Corresponding author: A. Kostenko a.kostenko@cwi.nl

HOW REVIVAL OF INDUSTRIAL HERITAGE DRIVES EXPERIENCE CONSUMPTION: CASE STUDY OF DRUGSTORE CLUB

Kostica, D.*

University of Arts in Belgrade, Belgrade, Serbia

This study aims to examine how the revival of industrial heritage drives experience consumption on the case of techno club called Drugstore, which is located in the former industrial zone dating back to the late 19th and early 20th century, on the right bank of the Danube river in Belgrade municipality of Palilula. Drugstore first appeared in 2012 as Culture Centre Drugstore in 2012 situated in the former BEKO building in the neighbourhood of the Lower Dorcol in the heart of Belgrade. Drugstore started working as a techno music club shortly i.e. in 2013 offering two venues -one indoor and one outdoor which worked only during summer season, whereas BEKO was once a successful state-owned factory which had a significant impact on the textile industry in the former Yugoslavia. The then already established low budget club managed to resuscitate one building of derelict brownfield and ever since has been a complete success with the young of age outgoing city crowd. However, the owners had to relocate due to the legal reasons so the new Drugstore club was established in 2014 in the space of the former slaughterhouse that in one period after the World War II belonged to BIM Slavija enterprise the ordinary course of business of which was food industry according to Mihajlov (2011). It is worth noting that young entrepreneurs in both cases opted for derelict industrial buildings for their locations which seems to be able to get through to them i.e. to ' speak' to regular visitors who frequent the place to consume experience during the late night weekends (Goulding et all, 2001 and 2002). By way of a case study this piece of research aims to come up with answers as to why precisely industrial heritage is suitable for creation of techno clubs and how and why consumers revel in their experience of this kind of settings. Research has been conducted on several respondents who are frequent techno music consumers and owners of the club mentioned and completed by way of techniques such as observation and field notes.

Mihajlov, S. 2011. Nastanak i razvoj stare industrijske zone na desnoj obali Dunava u Beogradu od kraja 19. dosredine 20. veka*,* Nasledje broj XII*, 91-116*

Goulding, C.; Shankar, A.; Elliott, R. 2001. Dance Clubs, Rave, and the Consumer Experience: an Exploratory Study of a Subcultural Phenomenon*, in* E - European Advances in Consumer Research Volume 5*, eds. Andrea Groeppel-Klien and Frank-Rudolf Esch, Provo, UT : Association for Consumer Research, 203-208.*

Goulding, C.; Shankar, A.; Elliott, R. 2002. Working Weeks, Rave Weekends: Identity Fragmentation and the Emergence of New Communities*,* Consumption, Markets and Culture*, 5 (4) 261-284*

* Corresponding author: D. Kostica stillinbelgrade@gmail.com

THE CONSEQUENCES OF THE INCORRECT ASSEMBLY AND DISASSEMBLY OF CONTEMPORARY TAXIDERMY INSTALLATIONS ON THE BASIS OF "PYRAMID OF ANIMALS" BY KATARZYNA KOZYRA AND "DOE" BY NATALIA BAZOWSKA

Kowalik, A.*

Academy of Fine Arts in Warsaw, Faculty of Conservation and Restoration of Works of Arts, Interdepartmental Division "NOVUM" for Care and Conservation of Modern and Contemporary Art, Poland

This study will focus on the protection of the integrity of atypical works of contemporary art and their appropriate care and conservation. The *Pyramid of Animals* by Katarzyna Kozyra and *Doe* by Natalia Ba owska have been analysed, with a focus on the use of taxidermy as a medium and a technological component present in contemporary art.

The first object analysed is the *Pyramid of Animals* (1992) by Katarzyna Kozyra. The installation is comprised of the sculptural component of the work alongside a video documenting the creation of the artwork. The installation consists of four prepared animals, arranged one on top of the other in sequence: a rooster, under it a cat with a dog, all permanently attached to a horse, which is the base. The installation is made using the old techniques of taxidermy utilizing e.g. ropes, threads, metal wires, wood, straw, sawdust and old preparations for tanning of hides, among other alum.

The *Doe* - one from the *Runic sculptures* series - by Natalia Ba owska was created first and exhibited from a ceiling. Unfortunately, as was the case with *Pyramid of Animals*, during de-installation, the metal wires protruding from its hooves – the only points for mounting the construction - were filed off. It turns out that such situations are common during the dismantling of exhibitions of installations such as these. Exhibiting the doe is currently impossible. The result of this in the case of the two installations is instability of used stuffed animals, cause deterioration of their condition in its various areas.

In conclusion, in order to interpret the ideas and message of the authors, an in-depth analysis of their formal and stylistic works has been done, studies of their life and work, interviews with them, and I have determined their cultural and historical context. There is a clear obligation to maintain the aesthetic and historical identity of each artwork, which requires their full documentation, including digital visualisation. This does not mean a necessity to challenge the true concept of the work and to distinguish what is different from the initial state and what was not the intention of the artist, but according to the INCCA (International Network for the Conservation of Contemporary Art) model of conduct – it is only a guideline for decision-making strategies. Through research that focused on analyzing the material structure, identifying the meaning and key idea of these works of art, it was possible to fully recognize them within the context of the history of the objects subjected to the above analysis. The aim is to preserve the originals while maintaining a balance between the conservation and restoration of their physical elements and the protection of the ideas and functions of those objects as seen by their authors.

* Corresponding author: A. Kowalik anna.kowalik@asp.waw.pl

PROTECTION OR DESTRUCTION? TRADITIONAL METHODS OF CONSERVATION CHAPELS, CROSSES AND ROADSIDES FIGURES ON BESKDY'S AREAS, LESSER POLAND VOIVODESHIP

Kudzia, A.*

Academy of Fine Arts in Warsaw, Poland

Shrines are an important part of the culture of the Polish countryside and are an integral part of the Polish landscape. In the form of a lone cross standing on the edge of the field, figures stone on the road or column supported roof with a broken figure of saint person, they created a kind of harmony with the nature surrounding them. Nowhere do we meet this phenomenon on this scale, so perfectly imaging faith of the people, connected with the Polish countryside.

We can meet it practically everywhere: on the countryside road, near houses and farms, on the town squares, on the border of the village, on the graves, in cemeteries, near churches, on the representative streets and central place in the city, on the wall of the houses, on the trees. Shrines have a very important cultural function – people build it to thanksgiving, votive or commemorative. Shaped weekday people, influenced the life of the community through meetings, prayers, rites of saying goodbye dead. Independent part of the existence of shrines are the amazing stories and legend which build the mythology of polish countryside. These monuments represent a high artistic value associated with regional tradition of crafts and decorating. Over time, they wear out, and gradually fall into disrepair. As objects of high artistic value require professional and urgent maintenance tasks. However, a large number and variety of chapels in Poland (this phenomenon on a global scale) does not allow for renovation of all objects. It is difficult, hard and long term task. Therefore, chapels' maintenance remains mostly in the hands of local people who look after their heritage.

The following study aims was created to show traditional methods used by the locals for renovation of shrines using accessible materials and knowledge not always compatible with the conservation principles. Fieldwork consisted of analysis and photographic inventory methods used by the locals to take care of shrines and on interviews held with local people – carers. Important part was stratigraphy researches of selected objects which shows sometimes a lot of layers of paint on the stone surface.

Attempt was made to assess this phenomenon, both due to the damage flowing from the sometimes thoughtless actions and the positive aspects of some used methods. Subject seems to be so difficult that it comes into contact two world: of professional maintenance task with local folklore and cultural traditions, which usually is totally different from conservators thinking. For years residents of the village renovate shrines without any control. They regarded colorful shrines as property so it is difficult to accept conservation treatment.
During the study, significant proved to find an answer for few questions – which shrines and why we should choose to renovate, how we should to do it, how to educate the residents of the village, who can be hard student, why changed approach to the care of the chapels then and now, why there is no agreement between residents, especially small villages and conservators, how generational change affects the state shrines, how fades particularly important integrating role of these objects.

*Corresponding author: A. Kudzia akudzia87@gmail.com

INVESTIGATION OF SURFACE ACTIVE MATERIALS FOR PAPER CLEANING

Kupčiūnaitė, J.*; Liubinienė, M.; Beganskienė, A.

Department of Inorganic Chemistry, Faculty of Chemistry, Vilnius University, Vilnius, Lithuania

The deterioration of paper in books and archival materials due to the degradation of its cellulosic substrate has been recognized since the turn of the century. The principal changes that act in the structure of cellulose and that cause its alteration are biodegradation, photo degradation, acid hydrolysis and oxidation. Washing is a fundamental treatment that can improve appearance of document and reduce the acidity simultaneously thus stabilizing paper chemically.

Given the importance of the preservation of paper medium, the objective of this study is to adapt the surfactants in the washing process and to investigate their effect on paper properties. During this study the change of mechanical, thermo-resistance, acid and optical properties of the paper samples, which were affected by surfactant (Amytis, Tinuvetin JUN HC, Tween 20, Triton X-100, P3 – Triquart, Bromosept 50) aqueous solutions, was examined. The most suitable surfactant material for cleaning grease stains from paper medium was proposed. To conduct the research, a filter paper was chosen, made of 100 % cellulose. Paper samples were washed in surfactant aqueous solutions, dried at room temperature and thermal- aged to 500 h in a drying oven. Mass spectroscopy (MS), elemental analysis, electron paramagnetic resonance (EPR), infrared (IR) and UV/Vis spectroscopy, thermogravimetric analysis (TG), the tensile test, the contact angle, polymerization degree and acidity measurements methods were used for samples characterization.

This work showed that all tested surface-active and disinfection materials into washing procedures does not have significant impact on the acidity of the paper, degree of polymerization, it changes the paper sorption properties and thermal stability minimally, except Bromosept 50 solution. During the examination of paper specimen surface with SEM analysis methods, it was established, that during the washing the fiver swelling is not avoidable and change of paper medium dimensions is irreversible, but no signs of destruction were observed even after heat-aging of 500h. After thermal - aging, the intensity change of sample absorption in UV/Vis spectrum is very slight, except of the samples, affected by P3- Triquart solutions. It is observed that rinsing the samples for 3 times (each time 10 min.) in the distilled water bath, Surfactant material failed to be washed out completely from the samples, potential residue is 0,3 %- 0,4 %. The most effective way to remove oily stains is to clean the paper medium by hexane or acetone and then washing again with 1 % P3- Triquart and Triton aqueous solution.

* Corresponding author: J. Kupčiūnaitė juste.kupciunaite@gmail.com

RADIOCARBON DATING OF RESTORED BONE SAMPLES

Liccioli, L.[1,2*]; Fedi, M.E.[1]; Mandò, P.A.[1,3]; Scirè Calabrisotto, C.[4]

[1]INFN Sezione di Firenze, Sesto Fiorentino, Florence, Italy, [2]Dipartimento di Chimica Ugo Schiff, University of Florence, Sesto Fiorentino, Florence, Italy [3] Dipartimento di Fisica e Astronomia, University of Florence, Sesto Fiorentino, Florence, Italy, [4]Dipartimento di Studi Umanistici, Università Ca'Foscari Venezia, Italy.

When bones to be radiocarbon dated are not directly recovered from an archaeological site, but from a museum context, it may be necessary to pay attention to the possible presence of restorations. One of the most widespread products used for restoration is an acrylic resin: Paraloid B72®. This compound being synthetic, it has zero radiocarbon content. Therefore, if it is not totally removed during the extraction procedure of the collagen (which is the typically dated bone component), the measured radiocarbon concentration is lowered, and the deduced apparent date comes out to be older than the true one.

We analysed two restored bones from the Anthropology Musem of the Florence University: a left ulna and a right humerus. For each bone, we got a sample in the area of the restored break (contaminated area) and one well apart (clean area). The latter gave us the reference for the unaltered ^{14}C concentration of each bone. Accelerator Mass Spectrometry (AMS) measurements were performed at the INFN-LABEC laboratory in Florence, where a 3MV Tandem accelerator is installed. Chloroform ($CHCl_3$) has been chosen as the key solvent to fully remove the Paraloid contamination, thanks to its high solvent power and high volatility. Moreover, we tried to characterize the potential contamination before radiocarbon measurements using the Fourier Transform Infrared Spectroscopy (FTIR) technique and the C/N ratio measured during the sample combustion (performed in an elemental analyser). The AMS measurements highlight the importance of using the new procedure for a complete removal of the contaminant. After $CHCl_3$ extraction, the contaminated samples are consistent with those used as reference. In addition, we tested the $CHCl_3$-based procedure on other bone samples collected in an archaeological site of the Bronze Age in Southern Cyprus. In this case, the samples had been treated using another synthetic material, a glue called "K60". This kind of material is based on polyvinyl acetate and it was tested in several restoration campaigns. Even though we did not have any reference values for these samples, the measurements showed radiocarbon ages that can be considered consistent with the chronological framework of the site. This result suggest the idea that we can apply the same extraction procedure on samples contaminated with different synthetic resins.

* Corresponding author: L. Liccioli liccioli@fi.infn.it

PLASTICS EMITTERS OF VOCs IN CONTEMPORARY ART COLLECTIONS. PROTOCOLS REVIEW FOR ITS CONSERVATION

Liébana Molina, S.*

Basque Country University, Bilbao, Spain

Plastic conservation is a relevance growing challenge whilst materials are being threatened as time goes by, since nowadays there are not any reliable data enabling to undertake procedures on the works keeping their substance pristine. For this, a priori, the best option is assumed to be developing a set of rules that will afford their preservation.

Presence of *Malignant plastics* (Williams 2002) this is, those emitting Volatile Organic Compounds (VOCs) in their degradation process, is a serious problem for the plastic preservation in Art Collections, since they mean a potential danger for plastics themselves and other nearby materials.

Plastic contemporary artworks preservation is being a research object for the latter years. Even though so, VOCs problem has not been studied in depth from the conservation-preservation field.

This poster shows the results after the review on the most recent researches related to plastics emitters of VOCs. The conclusions of them let us know what plastics are polluting and what do they emit. As well as, their potential casualties and damages; and how they are identified.

We also include the conclusions from the surveys carried out in Museums and Institutions whose collections hold plastic made objects and pieces of art. The study has been carried out at an international level comparing it with the specific reality of the Spanish territory. Its analysis generates interesting results.

The data collection analysis brings to light the absence of specific protocols for plastic preservation, even more so if it is about those emitting VOCs.

Williams, R.S., 2002. Care of plastics: Malignant plastics. WAAC Newsletter. Available at: http://cool.conservation-us.org/waac/wn/wn24/wn24-1/wn24-102.html.

* Corresponding author: S. Liébana Molina sara.liebana@ehu.eus

REMOVING PENCIL LEAD ON ACRYLIC SURFACES CASE STUDY: AGNES MARTIN, MUSEUM OF FINE ARTS BOSTON

Lobato Mínguez, D.*

Museo Nacional Centro de Arte Reina Sofia, Madrid, Spain

Acrylic paintings' cleaning has been an essential topic of study for years, leaded by mayor institutions as Tate Modern or Getty. Given the important scientific advances achieved in terms of material behavior knowledge, today conservators realize how challenging any cleaning treatment can be without causing any long-term damage. In order to get successful results it is mandatory not only to know deeply the material but also to lean any treatment proposal in previous technical studies to provide the correct solution, if it exists, adapted to every case.

This paper pretends to illustrate this current issue with the fascinating case study of an Agnes Martin's acrylic painting: *Untitled #15,* 1988. The American abstract painter stands up for her meditative works which express a personal and spiritual vision through formal abstraction. *Untitled #15* is painted in delicate tones, overlaid with repetitive pencil lines. The slight irregularities introduced by her hand create a surface that seems to vibrate, exhibiting a powerful human quality which contrasts with the seemingly mechanized process often associated with Minimalism.

Known the importance of conserving immaculate Martin's painting, the MFA conservation department considered to remove some fingerprints and smudges areas in the pencil lines in order to recover the pristine surface. The complexity of the painting surface and all the questions aroused after different spectral studies, analysis and tests made this project an interesting example to share with conservators and curators.

Condition examination showed undetermined brownish, glossy spots all over the painting surface, more visible under UV light. In addition, under Infrared reflectography three sets of pencil lines were found underneath, and also, cross sections revealed several white paint layers. All this new information opened other dimension of questions related with the painting life and gave us a better knowledge about the materials to work with to remove the fingerprints and smudges areas.

After testing with the pH adjusted Modular Cleaning Program -developed by Chris Stavroudis- and analyzing the swabs we could check there was always a minimum pigment loss using water solutions, which limited the treatment to dry methods.

In conclusion, this lecture runs through the difficulties the acrylic paint as a material has; the main cleaning methods and the problems and partial solutions chosen in the Agnes Martin case whose justification came from the information the previous studies revealed.

* Corresponding author: D. Lobato foto.restauracion@museoreinasofia.es dianalobmin@gmail.com

CULTURAL HERITAGE DOCUMENTATION AND CONSERVATION: THREE-DIMENSIONAL (3D) AND GEOGRAPHICAL INFORMATION SYSTEM (GIS) TECHNIQUES FOR SHRAPNEL DAMAGE OF FACADE SCHOOL OF MEDICINE OF THE COMPLUTENSE UNIVERSITY OF MADRID

Lopez-González, L.[1]; Gomez-Heras, M.[2]; Mol, L.[3*]

[1] Polytechnics University of Madrid (UPM), Madrid, Spain, [2] Geosciences Institute IGEO (CSIC-UCM), Madrid, Spain, [3] UWE Bristol, UK

Projectile damage to buildings is a wide spread, yet underrepresented in weathering and conservation research as mechanism of deterioration. Affected sites range from buildings damaged in past conflicts, such as the First World War, to modern day threats to heritage properties in Syria and other countries, and field observations indicate that the effects of bullets and shrapnel impacts on building materials damage the materials both immediately and further deteriorate in the long-term. This communication deals with the documentation of spread and frequency of shrapnel damage on the School of Medicine of the Complutense University of Madrid. GIS was used to map damage as well as to determine focal points of impacts and therefore establish distance and other parameters that can be of use both from the point of view of documentation and studies on the long-term effect of this particular kind of damage.

The School of Medicine of the Complutense University is a listed building completed in 1935. The building was chosen as war damage, which was inflicted very soon after the completion of the building, during the 15 -18 November 1936 assault. The site was part of the battlefront for the duration of the war (1936-1939). As a consequence of this, the building was largely destroyed. Between 1941 and 1945 the building was reconstructed, during which bullet and shrapnel impacts across the whole building façades were deliberately preserved.

A digital 3D model inflicted very soon after the completion of the building, during the 15 -18 November 1936 as of the areas affected by shrapnel was produced to accurately document the location and characteristics of each impact. Single image photogrammetry was used to produce this 3D digital model of the walls, which was then used for GIS-based surface modeling. This approach yielded a dataset of accurately georeferenced physical characteristics of each of the impacts. This 3D analytical data provides a new insight into the damage caused by shrapnel impacts, which aids not only the restoration and preservation of this site but could be carried across to conflict sites where conservation analysis can play a crucial role in post-conflict heritage conservation.

Research funded by Geomaterials 2 (S2013/MIT_2914) Programme.

Figure 1. Shrapnel damage in the School of Medicine

*Corresponding author: L. López-González alopag@gmail.com

3D PRINT MATERIALS IN REINTEGRATION PROCESS

Lorenzo, L.*

Art School of Conservation and Restoration of heritage, Valladolid, Spain

The 3D printing is a unique technology that has proven useful in many sectors as diverse as medicine, architecture or industry since its origin. And it's looking for its way into the conservation and restoration in museums like the Louvre or the Victoria & Albert, being a perfect tool to support reintegration intervention. But as a young technology is neither fully developed its full potential, nor has proven useful in real intervention.

As a summit to degree studies in conservation and restoration, I made a research trying to explore some of the possibilities that 3D could bring to our way of intervening in the cultural heritage. We focus on develop some test scenarios, using the most common techniques in reintegration over different 3D printing materials.

The aim of this study is to find out what would be feasible and what is not, when applying the 3D printing techniques to the world of restoration. These processes are texturing, synthetic and traditional stucco, two different types of gilding, a special preparation based on oil for outdoor polychromed stone *(*called *"jaboncillo")*, different ways of chromatic reintegration (with and without stucco, watercolor or oils), and test of various natural and synthetic varnishes. And finally, a test in a 3D printed hand – use a 3D free model (open source) -to prove these processes in a figure volume.

We expect surprising and diverse results depending on the material, its nature and the developed test in each sample, but they all lead to the logical conclusion that, according to the case, is possible to apply 3D printing and materials to a restoration successfully.

* Corresponding author: L. Lorenzo lucia.lorenzo.piriz@hotmail.com

THE CERAMIC MURALS OF THE AP-2 MOTORWAY

Lozano Sancha, A.*

University of the Basque Country (UPV-EHU), Bilbao, Spain

In the year 1976, the company “Patronato de Autopistas del Ebro”, organized a competition to produce twelve large format ceramic murals which can be seen at the Service Stations of the AP-2 motorway.

The axis of the theme was the motorway itself, where competitors were invited to represent what the road inspired in them. The Project is historically framed in the epoch of the Spanish Transition (1975-1978) with the intention to modernize, open up internationally, and to develope the country´s infrastructures.

Amongst the selected artists names such as Ángel Garraza, Lluis Castaldo and Arcadio Blasco can be highlighted. Other important artists such as Enric Mestre, Pere Noguera, Madola or Claudi Casanovas were not selected. All of them are essential figures in the world of national and international artistic ceramists in the XX and XXI century.

These works constitute an important artistic group within the category of ceramic murals. However, because of diverse circumstances, currently there are shortcomings in its conservation and its presentation which makes it difficult to understand, interprete and view the artworks. The lack of interest in the murals has resulted in their deterioration due to no maintenance or the incorrect interventions according to the criteria of contemporary conservation.

Despite the fact that the motorway is in constant use, forty years after their creation, we find that this heritage is practically unknown and in danger of destruction. Although many people transit through the area very few stop to look at the murals. And besides the identification of the works is wrong or non-existent and there is little bibliography available, therefore knowledge of this legacy is practically unobtainable.

To conclude this work intends to study, dignify and project this group of murals to ensure its conservation and to make possible its application to other projects of a similar kind. In fact, the issues faced by the AP-2 ceramic murals are common among a large number of XX century outdoor artistic ceramics.

To travel along the AP-2 motorway stopping at these murals is an extremely interesting journey from an artistic point of view. Large formats, esthetic quality, fragmentation and modulation solutions, chromatism, and material strength which speak of the ceramics of the second half of the XX century, but nowadays their messages remain active.

Figure 1. Garraza, A., Blasco, A. and Safont, M. Murals. Three out of the twelve murals set.

*Corresponding author: A. Lozano amparolslh@gmail.com

PROPOSAL FOR THE ESTABLISHMENT OF A PROTOCOL FOR DOCUMENTATION OF CONTEMPORARY ART

Luque Rodrigo, L.[1*]; Moral Ruiz, C.[2]

[1] Universidad de Jaén, Jaén, Spain, [2] Universidad de Granada, Granada, Spain

Heritage and conservation professionals are constantly faced with the problem of documentation that we understand that is the first step for the conservation of contemporary art. This is largely because the databases that we handle do not provide the appropriate fields and thesauruses for artistic expressions, which use an infinite variety of techniques and media. These artistic expressions cannot always fit well into a defined style and frequently it is not simple even just taking measurement data. This problem augments when it comes to artistic expressions that are committed to a short duration, either by illegality in the case of urban art or due to the type of installation in question or just simply by the use of organic materials.

Therefore we propose the creation of a protocol that enables compiling as much information as possible to document works of contemporary art that meet these characteristics. It would consist in the creation of a more open database form and a georeferencing system that could be used not only by professionals but also by the artists themselves as well as by any citizen. This proposal will allow obtaining greater diffusion among the professionals, so that they can study and propose the conservation of certain works. This is relevant because the professionals (conservator-restorer, art historian, etc.), not always are aware of the existence of some of these artistic expressions.

The development of this database, with updated thesauri more in line with the new artistic expressions, will allow a more effective work by the heritage and conservation professionals. When addressing this issue, it will be observed the complex nature of these art forms through a series of study cases, which require a thorough documentation work for its understanding, but largely for its protection and social appreciation.

* Corresponding author: L. Luque lluque@ujaen.es

THE IMBALANCE OF URBAN DEVELOPMENT BETWEEN EASTERN AND WESTERN TISSUE: THE CASE OF TARANTO (ITALY)

Macaione, I.[1]; Dichio, B. [1]; Ippolito, A.[1*]; La Gioia, R.[2]; Anello, E.[1]

[1] Department of European and Mediterranean Cultures: Architecture, Environment, Cultural Heritage, University of Basilicata, Matera, Italy, [2] Independent Researcher in Urban Planning, Taranto, Italy – follower Nature City Lab, Matera, Italy

To understand the urban evolution of a city and to forecast development scenarios was necessary to start from a historical and urban reconstruction plans and projects which have influenced its urbanization. The research focuses its attention in the relationship between industrial development, more closely linked to the presence ILVA steel plant, and district of the city of Taranto. The "overall planning" has been influenced, in structure and morphology, from industrial settlements developed in the western part of the territory of Taranto, influencing the urbanization of the eastern tissue. This has fostered a development for "watertight" compartments, poorly connected to each other, which led to a fragmented development of the city. The study highlights how this situation is the result of the implementation of urban planning practices that have neglected the real potential of the area in favor of an industrial growth through the establishment of Ilva, which affected the growth of the city from the point of urban, environmental and socio-economic.

Objective of this research is to analyze how the lack of development of a territory can be resumed from the perspective of a hypothetical intervention of urban regeneration and how this becomes topic of conflict with current political, environmental and health. The project aims to study the recurrent themes in the history of the city and the territory and the urban-architectural culture, linked to current in reference to the new relationship between change and conservation, in addition to the strategy of environmental protection and recovery, bringing back these issues to unitary issue of regeneration of specific urban facts between artificial and natural. Essential objective will be to address issues relating to the redevelopment of a critical place in the geography of southern Italy, investigating on the settlement of the city, going beyond the idea of the public city consists of "islands" autonomous and physically separated from the rest of the city , and its regeneration in time, ready to grasp relationships with the context and with "local fields" to which belong the city today, no more border territories but rather centers of new urban geography dictated by metropolisation processes. Therefore, the aim of this contribution will be in finding the correct path of knowledge through reading, interpretation and further analysis of the transformations of cities in physical and conceptual terms.

* Corresponding author: A. Ippolito antonio.ippolito@unibas.it

CROSS PHENOMENA - THE NATURE_CITY MATERA (ITALY): FROM NATIONAL DISGRACE TO EUROPEAN CULTURE CAPITAL 2019

Macaione, I.; Sichenze, A.; Anello, E.*; Ippolito, A.

Department of European and Mediterranean Cultures: Architecture, Environment, Cultural Heritage, University of Basilicata, Matera, Italy

“Nature_City” is a vision through which the city of Matera is currently comparing itself to many other cities in the world. The recognition of Matera as Capital of Culture 2019 is mainly based on the appreciation by the European Commissioners for a complete paradigm of a city that in Matera is articulated through five kinds of settlement forms, achieved in nine thousand years of history, and now lived in different ways very close to each other due to the small size of the city. The latest studies show that the best known urban regeneration has taken place in the quarters called “Sassi”. During which it has moved from their being denounced by De Gasperi, in the fifties, as the "shame of humanity",to their becoming the most famous Italian recovery of an ancient city, joining as well the list of Unesco’s World Heritage Sites. Starting from the earliest settlements to the most recent, five kinds of cities have been enucleated that all together represent a "capital" of experiences whose richness gives rise to a living bio-diversity which now is the biggest asset that allows Matera to perform a cultural role worldwide. The Nature-City_LAB | Dicem, forms part of a programme of City workshops entitled Make way to Matera that is a design process that takes place in that part of the city once called periphery, particularly defined in the thirteen so-called modern"historical districts, located beyond the famous Sassi.

* Corresponding author: E. Anello enrico.anello@unibas.it

SAN LORENZO URBAN MEMORY MUSEM – SLUMM MAPCAST

Macchia, A.[1]; Rivaroli, L.[1]; Fiacconi, M.[1*]; Rivaroli, M.[1]; Donnini, A.[2]

[1] YOCOCU YOuth in COnservation of Cultural Heritage, Rome, Italy, [2] Etcware S.R.L., Rome, Italy

It is possible to create a museum where there are libraries instead of bookshops, artisan laboratories instead of gift shops, where the workers are the citizens, the educational projects and the night events are linked together and art is a vehicle for narration and regeneration: a museum that can be visited while waiting for the bus 492. This is SLUMM, San Lorenzo Urban Memory Museum.

SLUMM wants to illustrate the story of San Lorenzo, a quarter known for its bars and night life but with a rich and interesting past. Everything starts in 1884 with the construction of the first buildings that accommodate workers and it goes through the first world war bombing, the realization of the first Montessori school in Rome, the artists' artisan laboratories and the close connection with the university.

The SLUMM aim is to preserve the social, political and cultural transformations that happened in San Lorenzo through the voices and the memories of the people that had lived them and the places where they had happened.

SLUMM has already started several project as guided tours, where visitors walk through different itineraries following a single memory or a combination of them, or the collection of materials to realize a web platform.
One of them provides for guided tours using a new available technology by Etcware SRL Company called Mapcast.

Mapcast allows schools, citizens, cultural associations and users to add information to the one already available in order to be actively involved in the creation of culture.

* Corresponding author: M. Fiacconi info@yococu.com

COMPARISON BETWEEN TRADITIONAL AND SUSTAINABLE METHODS FOR CLEANING IRON STAINS ON MOSAICS OF THE COTTANELLO ROMAN VILLA

Macchia, A.[1*]; Luvidi, L[2]; Prestileo, F. [2]; Stella, E.M.[2].; Sfameni, C.[3]

[1] YOCOCU, Youth in Conservation of Cultural Heritage, Roma, Italy, [2] CNR – Istituto per la Conservazione e la Valorizzazione dei beni Culturali, Roma, Italy, [3] CNR – Istituto per lo Studio del Mediterraneo Antico, Roma, Italy

The aim of this work is the evaluation *in situ* of the effectiveness of sustainable methods, used to remove surface chromatic alterations induced by the iron corrosion products on limestone mosaic tesserae. Iron complexing or chelating agents, including "green" solutions such as cysteine, were compared with traditional methods: ammonium thioglycolate and ammonium citrate. Cleaning tests on pilot areas were performed on the mosaics of the Roman Villa of Cottanello (Rieti, Latium). This Villa is particularly relevant for its architectural plan and for the richness of its decoration (mosaic floors, marble, architectural terracotta, mural paintings); it is one of the most extensively excavated in the territory of the Sabina Tiberina. The history of the building is attested between the late republican period and the late antiquity; its rich repertoire of mosaics is dated between the first half of the I century B.C. and the first half of the I century A.D. Nowadays, the excavated rooms are covered by deteriorated sheet iron structures which have given rise to rust stains on the mosaic floors. The cleaning systems of rust stained tesserae were evaluated by analytical investigations (measurements of colorimetric variations, optical and SEM observations). All the methods tested *in situ* showed satisfactory results of cleaning effectiveness in comparison with the traditional ones, suggesting a replacement of the methods used so far and less sustainable for the environment and for the restorers. In addition, the low costs of the new tested products used could be an incentive to their use, maybe encouraging in the future a restoration not yet planned by the Archaeological Superintendence, due to current lack of funding.

Macchia, A; Ruffolo, S.A.; Rivaroli, L.; La Russa, M.F. 2016. The treatment of iron-stained marble: toward a "green" solution. International Journal of Conservation Science, Volume 7, Special Issue 1, 323-332

Spile, S.; Suzuki, T.; Bendix, J.; Simonsen, K. P. 2016. Effective cleaning of rust stained marble. Heritage Science, 4 (12), 1-10.

Sfameni, C.; Luvidi, L.; Stella, E.M.; Volpi, M. 2016. Nuovi mosaici e nuove ricerche presso la villa romana di Cottanello, in AISCOM XXI, Reggio Emilia 18-21 marzo 2015, 717-725.

Macchia, A.; Sammartino, M.P.; Tabasso, M.L.. 2011. A new method to remove copper corrosion stains from stone surfaces, Journal of Archaeological Science, 38(6), 1300-1307.

Alvino, G. 2000. I mosaici, in Sternini M. (ed), La villa romana di Cottanello, Bari, 73-104.

* Corresponding author: A. Macchia info@yococu.com

THE PAST AND THE PRESENT: COMMERCIAL GRISAILLES FROM DEBITUS

Machado, C.[1*]; Machado, A.[1,2]; Alves, L.C.[3]; Vilarigues, M.[1,2]

[1] Department of Conservation and Restoration, Faculty of Science and Technology, NOVA University of Lisbon, Portugal, [2] Research Unit VICARTE – Glass and Ceramics for the Arts, Faculty of Science and Technology, NOVA University of Lisbon, Portugal, [3] C2TN, IST/CTN, University of Lisbon, Portugal

The conservation and restoration of stained glass involves, in general, cleaning and consolidation, union of fractures and filling losses, sometimes, with chromatic reintegration. The stained glass restoration can often involve the replacement of painted glass, for this traditional materials and techniques are used.

Grisaille is a painting technique applied on stained glass panels; normally they present dark colors (grey and brown hues) and are made by mixing metal oxides (iron and/or copper) with a grinded lead-based glass. This is mixed with a binding agent, such as arabic gum, and applied on the glass panel. After annealing, at temperatures between 650-700°C, a thin layer of colorless glass with the metal oxides dispersed is formed on top of the base glass.

At present it is possible there are several companies selling many types of products to paint on glass, however, only a few of them present the required long term stability and compatibility with the original materials, both chemically and visually. On 1991 Hervé Debitus published a paper with a research on a new formulation of grisailles, made in similar ways to the original historic ones, resulting in a more stable material.

This work proposes a comparison between the written information disclosed by Hervé Debitus in 1991 and the grisailles that are sold nowadays by the Debitus atelier, in order to understand the difference between the first proposal and the ones currently commercialized. The grisailles were analyzed by means of optical microscopy, scanning electron microscopy, ion beam analysis and X-ray diffraction for a chemical and morphological characterization.

As preliminary conclusions it was possible to realize an evolution in the formulation of the grisailles, mainly, on the elements responsible for the color, appearing manganese in grisailles called by Noir ordinaire, Brun XVI and Brun XIII, in which, on 1991, the author report, mainly, the use of iron oxide and zinc oxide. In the grisaille called Depoli incolore we detected the presence of tin, while in this paper, Debitus refer this paint is only composed by the grinded lead glass.

Such studies are essential for the conservation and restoration of historical objects for it, is important understand not only the chemical and physical properties of the objects' raw materials but also the materials used in conservation and restoration techniques.

* Corresponding author: C. Machado cf.machado@campus.fct.unl.pt

"FAREWELL MY ART". GINO GRIMALDI'S WALL PAINTINGS IN THE CHURCH OF THE FORMER PSYCHIATRIC HOSPITAL IN COGOLETO (GENOA, ITALY). PREPARATORY INVESTIGATIONS FOR RESTORATION

Magrini, D.[1*]; Fratini, F.[1]; Riminesi, C.[1]; Pittaluga, D.[2]; Caruso, G.[2]

[1] ICVBC-CNR, Florence, Italy, [2] Università degli Studi di Genova - Scuola Politecnica - DSA, Genova, Italy

Gino Grimaldi (1889-1941), known as the "painter of Cogoleto's asylum", played the most important part of his artistic activity in the psychiatric hospital in Pratozanino, where he was interned from 1933 until his death in 1941. During his permanence into the hospital, Grimaldi was stimulated by doctors to paint and his work is considered to be one of the most complete examples of art therapy.

The former psychiatric hospital in Pratozanino was built in the countryside of Cogoleto in 1913 and it was composed of more than forty pavilions, included the church of *Santa Maria Addolorata*. The decoration of the church is one of the richest examples of the activity of Grimaldi, that the artist finished in 1937 and signed with the inscription *Last Opus. Farewell My Art*.

The diagnostic campaign aimed to the conservation of these mural paintings by now in extreme precarious conditions, started in 1996 and is now included within a broader research project "InITINER@", focused on dissemination and on the enhancement of cultural activities on the territory.

Several analytical techniques were applied to identify the materials and the artistic technique and to define the state of conservation of the wall paintings. In particular, the study was necessary to clarify the processes of alteration due to the joint action of salts and ambient humidity.

In this work, results related to a first phase of non-invasive investigations aimed to observe the pictorial surface and to define the palette, are presented. Observations by means of ultraviolet radiation (UVf) were carried out in order to assess and to localize any fluorescence emission from the painting materials (binders, protective, colorants ...). Moreover, x-ray fluorescence measurements (XRF) were performed to define the elemental composition of the pigments used and to clarify some doubts coming from the imaging acquisitions.

Figure 1. Detail of the wall painting

* Corresponding author: D. Magrini, d.magrini@icvbc.cnr.it

THE PRESERVATION OF VERNACULAR ARCHITECTURE TOWARDS A SUSTAINABLE DEVELOPMENT OF LOCAL COMMUNITIES

Maio, R.[1*]; Martin, E.[2]; Sojkowski, J.[3]

[1] Department of Civil Engineering of the University of Aveiro, Aveiro, Portugal, RISCO - Aveiro Research Centre of Risks and Sustainability in Construction, [2] Department of Architecture and Spatial Planning of Namibia University of Science and Technology, Windhoek, Namibia, [3] United States of America

Vernacular architecture is commonly acknowledged as the fundamental expression of the culture of a community and at the same time, of the world's cultural diversity. The fact that both tangible and intangible aspects are here intertwined at the core of the OUV (Outstanding Universal Value) of vernacular built heritage, underscores the importance of protecting the authenticity and integrity of these practices. Some of the most frequent recalled issues responsible for threatening the survival of vernacular heritage in Africa are the natural disasters, the lack of knowledge and awareness of local communities in general, the desire for modernization and the well-known globalization phenomenon. By the one hand, it is important to bring attention at both international and national levels to these issues by encouraging research and documentation on African vernacular heritage. On the other hand, it is equally important to raise awareness close to local communities to keep them stuck to their roots and traditions, which in many cases provides their very means of income through tourism. This emphasizes the importance of preserving these practices and these villages from being abandoned. Moreover, sustainable strategies should be developed and promoted in order to protect and decrease the structural vulnerability of vernacular built heritage.

Bearing in mind the above, this paper aims to face some of these societal issues concerning African vernacular cultural heritage by providing a detail architectural and morphological characterization of the "Ovambo" tribe, in northern Namibia. With this case study, the authors aim to highlight the OUV of vernacular cultural heritage in Namibia, and raise awareness to the immediate need of protecting not only these structures' integrity but also the respective sustainable building techniques as living traditions (intangible heritage). Therefore, structural retrofitting and renovation strategies are discussed and proposed, giving priority naturally to the use of local and highly sustainable materials.

* Corresponding author: R. Maio ruiamaio@ua.pt

MULTI-RISK MITIGATION APPROACH TOWARDS A SUSTAINABLE DEVELOPMENT OF LOCAL COMMUNITIES: THE NAMIBIAN VERNACULAR CULTURAL HERITAGE AS A CASE STUDY

Maio, R.[1*]; Martin, E.[2]; Ferreira, T.M.[1]

[1] Department of Civil Engineering of the University of Aveiro, Aveiro, Portugal, RISCO - Aveiro Research Centre of Risks and Sustainability in Construction
[2] Department of Architecture and Spatial Planning of Namibia University of Science and Technology, Windhoek, Namibia

Vernacular cultural heritage is the most vulnerable class of structures mainly due to low material resistance and lack of both structural design and maintenance. As the frequency and magnitude of disasters have been increasing over the past few years, placing disaster risk mitigation as a top priority matter in policy-makers' agenda, the safeguarding of local communities' integrity and the preservation of vernacular cultural heritage is a key issue nowadays. Therefore, the survival of vernacular built heritage relies not only on identifying the forces that are threatening a determined site, but also on the efficiency of how these threats are tackled and overcome. Even though some of these threats have been identified in the late 90's by ICOMOS, little has been done so far towards the protection and preservation of vernacular architecture in developing countries, particularly in Africa, the world's second-largest and second-most-populous continent.

As many other countries in Africa, Namibia has been observing a gradual increase of both frequency and severity of disasters in recent years. The consequences in terms of damage and loss have great impact on local communities, the economy, infrastructure, and inevitably in the environment. Effective disaster risk mitigation strategies should not only take into consideration threats as independent events but also understand their dependency by means of combined events and cascading effects. However, the analysis of multi-hazard disasters brings additional challenges to researchers due to the differing characteristics of processes and outputs available to evaluate the hazards and the vulnerability of communities and infrastructures to those hazards.

Bearing in mind the exposed, the aim of this paper is to give an outline of the main hazards that are currently threatening Namibian vernacular cultural heritage, discuss the challenges associated to multi-hazard disaster risk assessment, and support decision-making process through guidelines for the implementation of multi-hazard disaster risk mitigation measures, contributing therefore to the sustainable development of local communities and to the preservation of vernacular cultural heritage.

* Corresponding author: R. Maio ruiamaio@ua.pt

LA CORACERA CASTLE: NEW ENTRANCE PAVILION, SITE RESTORATION AND IMPROVEMENT

Maira Vidal, R.[1*]; Fernández Díaz, R.[2]

[1] Technical University of Madrid, Madrid, Spain, [2] Enjarje Arquitectura, Madrid, Spain

The Directorate-General of Cultural Heritage of the Autonomous Community of Madrid recently launched a collaboration programme with the Madrid School of Architecture to help young architects trained in architectural heritage restoration make a start in their career. This paper is presented within this context and describes the project for the restoration of the wall leading to La Coracera Castle and the construction of a visitors' centre by Enjarje Arquitectura, a young architectural studio.

La Coracera Castle dates back to the fifteenth century and is the second in importance in the Madrid Region since it is one of the earliest fortifications prepared for artillery. It has recently been restored by the Directorate-General of Cultural Heritage, but these restoration works focused solely on the castle, leaving the perimeter gardens and the entrance to the fortress untouched. The need for a new boundary wall and visitors' reception area led to further works in 2014, which are the subject of this paper.

The new wall marking the limits of the site was duplicated and the bays between converging walls created the spaces that form the pavilion. The size and layout of these granite walls enable them to act as retaining elements allowing the uneven ground to be addressed and at the same time minimizing the visual impact of the new facilities, which become part of the landscaping. The pavilion itself is on the path to the castle and emulates the ancient use of bent entrances to fortifications. Another of the main aims was the recovery of local building traditions through the materials. Having been plundered in the past by the villagers to build their homes, the original granite from the castle walls has now been recovered to build the pavilion. Thus granite again becomes the principal feature of the main elevation in thick stone walls that provide high thermal inertia which, together with the right orientation, allows energy to be used efficiently.

Figure 1: Image of the pavilion entrance and aerial view of the work

* Corresponding author: R. Maira Vidal rociomaira@enjarje.com

INDUSTRIAL HERITAGE CONVERTED INTO MUSEUMS. HIGHLIGHTS IN ARAGON (SPAIN)

Marcén Guillén, E.*

History of Art, Zaragoza, Spain

It is no secret to anyone that recovering industrial heritage for exhibition purposes has been on the spotlight in the last decades. The fast development of productive processes since the beginning of the industrial era has caused the abandonment of many factories and plants that had become useless and outdated, posing the problem of what to do with these usually large and very specific buildings. The increasing number of abandoned industries, together with a deeper awareness of the necessity to preserve these unique examples of our industrial past, has led to the proliferation of recovering strategies in this sense.

Musealisation has become one of the more frequent choices regarding the recovering of industrial heritage (Hernández, 2007). Some famous examples come to mind, such as the power stations of Bankside (London) and Mediodía (Madrid), now housing the Tate Modern and the CaixaForum respectively. Industrial architecture has also been reused as venue for different kinds of artistic experiences, related to exhibition (museums and art galleries, mostly) as well as to artistic creation in a wide sense, as studied by Lorente (1999).

The aim of this paper is to present the conclusions of a reasoned analysis of the industrial buildings repurposed as museums and exhibition galleries in the region of Aragón (Spain), linking its most important cases to national and international examples in order to detect the main and most succesful trends regarding recovered industrial heritage.

In Aragón, the number of industrial structures turned into artistic sites has largely grown over the past years. These interventions can be classified in one of seven categories, according to the manufacturing sector to which the original site belonged: food industry (factories and wine cellars), farming, hydraulic (water tanks), storage (cereal silos), communications and transport (train stations), mining and workshops (carpentry, forge, etc).

In order to perform their analysis, using the relationship between the exhibited contents and the building that houses it is proposed as the main criteria. Three categories are established going from the closest association between building and contents to those where there is no link between them: comprehensive musealisation, related exhibitions and totally unrelated contents. The Mining Museum from Escucha (Teruel), the Wine Museum from Cariñena (Zaragoza) or the IAACC Pablo Serrano in Zaragoza are just a few examples that will help to understand the premises of each of these categories. A closer look to the mining heritage will also take place, through the study of different efforts inspired by the loss of mining activity in several districts of Teruel such as Cuencas Mineras and Andorra-Sierra de Arcos.

Hernández, A. 2007. El reciclaje de la arquitectura industrial. Jornadas sobre el patrimonio industrial y la obra pública. Zaragoza, Gobierno de Aragón, 29-51.
Lorente, J.P. 1999. Vino nuevo en viejas cubas: artistas, galeristas y museos/centros de arte contemporáneo en antiguas naves industriales. Artigrama, 14, 183-204.

* Corresponding author: E. Marcén Guillén elena_marcen@yahoo.es

THE ROMAN AQUEDUCT OF MELANICO IN SANTA CROCE DI MAGLIANO, MOLISE: PROPOSALS FOR ITS CONSERVATION

Marino, P.[1*]; Capozzi, A.[2]; Colombo, D.[3]

[1] Department of Architecture, Second University of Naples, Aversa, Italy, [2] Archaeologist, Riccia (CB), Italy, [3] Soprintendenza Archeologica del Molise, Archaeologist, Campobasso, Italy.

Melanico is a small fraction of the town of Santa Croce di Magliano, in the province of Campobasso. The landscape appears as an extensive floodplain dotted with agricultural fields, interrupted only by the remains of a Benedictine Abbey situated not far from the river Fortore. The area has been the subject of surveys during the post-quake period (after the devastating earthquake of 31/10/2002) which has uncovered some aspects of the Roman occupation of this territory. The surveys, in fact, showed a complex system of settlements aimed at the agricultural use of the area. In addition to the various sites identified during the surveys, there is a prominent artefact in connection with the abbey, a water system comprising a conduit in *opus mixtum*, and two rectangular tanks realized in *opus caementitium,* positioned one to the east, upstream of the duct, and the other to the west, 200 meters from the depressurization pillar (controlling water pressure). The entire water system is developed along an artery road connecting Merze Traette to Melanico.

The monumentality of the water structure seems to indicate an abundant demand for water by a large settlement, which probably was located behind the abbey. A preliminary survey in the aforementioned area, revealed a large amount of artefacts, spread over a very large area. These factors would confirm the presence of such a large settlement, although it is not yet possible to specify the type. The funerary inscription embedded in the wall on external face of the Abbey is in connection to the *gens Tillia*, already attested in this part of the Molise.

It is the conduit and the two tanks that have suffered the greatest alteration over the centuries; the first is preserved to a height which is somewhat limited and therefore to prevent further gaps, one could plan good consolidation of the entire structure as well as the prevention of the growth of vegetative elements that could compromise the integrity of the same. For the tanks, instead, an intervention could eliminate later additions such as structural elements, and then proceed to the structural consolidation of elements that, especially upstream of the duct, appear highly damaged, with portions of masonry broken and no longer in place. In case elements of hydraulic mortars are encountered in the tanks, actions should be taken for their recovery and consolidation, in order to avoid the loss of sensitive data, indispensable for understanding the structure.

*Corresponding author: P. Marino. pasqualem.1983@gmail.com

MAXENTIUS 3D PROJECT

Marsicano, L.*; Malatesta, S.G.; Lella, F.; D'Ignazio, E.; Massacci, E.; Onofri, S.; Sgarro, A.

Archeo&Arte 3D Lab – Digilab Sapienza University of Rome, Rome, Italy

Maxentius 3D Project starts from a workshop conducted by Archeo&Arte 3D Lab DigiLab Sapienza University of Rome. Aim of the project is to propose a full 3D model of the Circus of Maxentius in Rome encompassing all the aspects of the environment, as well as the architectural system.

The first step of the work was the study of the archaeological data, afterward the archaeologic team carried out a survey to integrate the published data with new information in order to create a metrically correct reconstruction. To model both the landscape and the architectural structures it was used Blender, open source software. Starting from the altimetric data it is possible to reconstruct the morphology; after the import of the contour lines in Blender it was necessary to convert the curves into mesh and then, using the add-on Delaunay triangulation and Voronoi Diagram, it was possible to generate the 3D model. The following step was the elaboration of the architectural 3D model including the hydraulic system and the arrangement of decorations. Finally the team went ahead with the texturing of the models through the use of the Node Editor in Cycles Render.

The result is a metrically and scientifically correct 3D model of the Circus of Maxentius useful to offer to both specialized and general audience a new kind of archaeological approach.

* Corresponding author: L. Marsicano marsicano.lucia88@hotmail.it

CALCIUM SILICATE HYDRATE CHARACTERIZATION BY SPECTROSCOPIC TECHNIQUES

Martín-Garrido, M.[1,*]; Martínez-Ramírez, S.[1]; Pérez, G.[2]; Guerrero, A.[2]

[1] Instituto de Estructura de la Materia (IEM-CSIC), Madrid, Spain, [2] Instituto de Ciencias de la Construccion "Eduardo Torroja" (IETCC-CSIC), Madrid, Spain.

The main component of the binders present in the contemporary Cultural Heritage mortars is an amorphous hydrated calcium silicate (called C-S-H† gel) whose structure resembles that of the tobermorite and jennite minerals. However, while the C-S-H gel has no well-defined stoichiometry, the other two minerals are crystalline with a well-established chemical formula, $Ca_5Si_6O_{16}(OH)_2 \cdot 4H_2O$ for tobermorite and $Ca_9Si_6O_{18}(OH)_6 \cdot 8H_2O$ for jennite. Both minerals have a Ca/Si ratio of 0.83 and 1.5 respectively, while the C-S-H gel has a variable stoichiometry, presenting Ca/Si relations ranging from 0.5 to 2.1 (Lothenbach et al, 2015).

Formation of tobermorite, jennite or C-S-H gel with variable Ca/Si ratio depends on the synthesis procedure due to different solubility of raw materials and therefore variable reactivity. The objective of this work is to determine the effect of two C-S-H gel synthesis methodologies in the main phases formed.

The synthesis of the C-S-H gel was done in different ways: a) the double decomposition (Chen et al., 2004), and b) hydrothermal (Grangeon et al., 2013) method. The formation of the amorphous compound was monitored by Raman and Infrared Spectroscopy. XRD analysis was performed in order to follow the crystalline calcium silicate phases formed under hydrothermal synthesis.

† Cement Chemistry Notation, C = CaO, S = SiO_2, H = H_2O.

This research was supported by the Comunidad de Madrid and the European Social Fun (Program Geomateriales 2-S2013/MIT-2914).

Lothenbach, B.; Nonat, A. 2015. Calcium silicate hydrates: Solid and liquid phase composition. Cement and Concrete Research 78, 57-70.
Chen, J.J.F.; Thomas, J.J.; Taylor, H.F.W.; Jennings, H.M. 2004. Solubility and structure of calcium silicate hydrate. Cement and Concrete Research 34, 1499-1519.
Grangeon, S.; Claret, F.; Lerouge, C.; Warmont, F.; Sato, T.; Anraku, S.; Numako, C.; Linard, Y.; Lanson, B. 2013. X-ray diffraction: a powerful tool to probe and understand the structure of nanocrystalline calcium silicate hydrates. Cement and Concrete Research 52, 31-37.

* Corresponding author: M. Martín-Garrido mmarting16@gmail.com

WIRELESS MONITORING OF MOISTURE FOR WALL PAINTINGS PRESERVATION

Martínez-Garrido, M.I.*; Ergenç, D.; Fort, R.

Geosciences Institute IGEO (CSIC, UCM), Madrid, Spain

Wireless sensor networks have been introduced in a great number of fields in recent years, the cultural heritage among them. This work presents results from a monitoring campaign based on a wireless sensor networks conducted at the Complutum archaeological site in Alcalá de Henares (Madrid, Spain) which was listed as a cultural heritage asset (Spanish initials, BIC) in 1988 and since 2008 forms part of the network of outdoor archaeological museums open to the public in the region of Madrid, Spain.

The Roman city was built in the first century of the Christian era and it was rehabilitated and reformed in the third. The site was close to several major imperial roads as well as to the River Henares and its fertile valley.

Three monitoring points or wireless nodes were positioned on the House of Griffins, the site's central element and one of the compound's largest (around 1000 m2, including house and courtyard). The House of Griffins was in use until the fourth century when it was destroyed by fire. It is possible to find several wall paintings in the site in which the objective of this work was focused. Different depths and heights in wall paintings were monitored with Sensirion sensors of temperature (T) and relative humidity (RH). CO2 monitoring was also possible since each wireless node was compound of 4 inputs (4 T/RH or 3 T/RH sensors and 1 CO2/T/RH sensor). Weather conditions were also monitored by a fully integrated wireless weather station (indoor and outdoor temperature and humidity, barometric pressure, wind speed and direction, dew point and rainfall).

The wireless sensor installation had the objective of monitoring of the effect of weather conditions and other determinants (capillary rise, solar radiation, influence of the metallic protection…) on wall paintings. Some monitoring points were selected to study microclimatic conditions close to paintings and inside the constructive elements.

Thanks to the study it was possible to analyze humidity and temperature fluctuations according to environmental changes, capillary rise and protection effect from metallic cover on House of Griffins and CO_2 concentrations according to the visitors' influence.

Research funded by Geomateriales 2 (S2013/MIT-2914). The cooperation received from Complutum is gratefully acknowledged.

* Corresponding author: M.I. Martínez-Garrido mi.martinez.garrido@csic.es

BELL RINGING NOWADAYS. NEW PERSPECTIVES FOR AN INTANGIBLE HERITAGE

Martínez Roig, E*.

Universitat de València, València, Spain

Ringing the bells has been a common practice along history. It is well known as a language which builds time and space of the community. We can analyse this fact from different perspectives as Sociology, Anthropology, History and Geography in order to have a complete interpretation of the significance of this shared common voice.

This cultural expression is still alive in several communities, for example along the United Kingdom and Italy mainly. But there are other territories that "suffered" misunderstood concepts of modernity and got their bells mechanised, loosing their original and traditional ringing or rhythms replaced by monotone and repetitive sounds. The creativity of the ringers was destroyed by new mechanisms that interfere in the traditional use of the instruments.

This has been the case of Spain. We have lost lots of different ringings due to mechanisations and the disappearance of bell ringers. Furthermore the traditional installation of bells in the tower and their artefacts were destroyed and replaced by industrial ones.

But, luckily, there has been a shift in the last decades. We focus our attention in the city of València, located at the east of Spain. In this city and its surroundings it exists a new cultural movement of bell ringing. New bell ringers, volunteers, that have learnt to ring tower bells and who are in charge of annual calendars of ringings.

This trend started in the 70s and finally in the 80s got formal structure with some groups or associations that laid the foundations of a new managing model of this intangible heritage. One of the most interesting cases is the one from València's Cathedral.

Recently awarded with a Special Mention from Europa Nostra, "*Campaners de la Catedral de València*" (The Bell Ringers of València's Cathedral) is a locally, nationally and internationally recognised and well-know group of bell ringers. This group of voluntary ringers is not only carrying the annual calendar of ringings but has established a new concept of preserving this heritage by defining a research, training, spreading and communication model leaded by young people mostly. Its members do research in different fields (casting bells, traditional ringings, etc.), attend congresses, publish articles, essays and books and spread the knowledge in order to raise awareness among the society.

Moreover, their work is available in one of the major database of towers, bells and ringings inventories that exists nowadays (http://campaners.com). From this website, researchers and interested ones, could get access to bibliography, audio-visuals and files that are freely shared.

A new vision of the tradition of ringing bells, which is succeeding in preserving this diverse and rich heritage in València. A new model of managing bells and their music that is exported to other territories. A new and contemporary way to look at our heritage, an alive heritage thanks to those bell ringers who are still playing the most ancient music of the city.

* Corresponding author: E. Martínez Roig eliseo@eliseomr.com

VIRTUAL PLATFORM FOR DESIGNING, PLANNING, AND CONTROL, INTERVENTION AND MAINTENANCE WORKS IN THE FIELD OF THE CULTURAL HERITAGE CONSERVATION- "PETROBIM"

Mateos Redondo, F.J.[1]; Valdeón Menéndez, L.[1]; Rojo Álvarez, A.[1]; Armisén Fernández, A.[2]

[1] GEA, Geological Consulting, Oviedo, Spain, [2] CONTROL BIM, Oviedo, Spain

From emblematic historical-artistic sites included in the World Heritage Sites by UNESCO to thousands of monuments all over the world, in their corresponding architectural projects, master plans, technical studies, memorandums, conservation plans, management and dissemination of cultural heritage, delineated graphical drawings or three-dimensional graphical archives (3D) provide very limited information respecting to their presentation, exploitation and graphic queries or data. In addition, the successive interventions works that take place through the years on a single monument, generate a large amount of information such as written and graphical documentation, printed or digital outputs and different file formats, all of them handled by different technicians, make extremely difficult handling, storage, analysis and update of the involved information.

In order to solve these problems arise PetroBIM, a virtual platform, created by means of own technology [WOB: "Walking On BIM"], based on a powerful but friendly management and consultation tool that allows converting, designing, planning, and control, the whole information linked to master plans, and conservation projects from cultural heritage on to a live single 4D model. This is possible thanks to data base linked to BIM 3D models and a specifically developed technological front-end display which allows users, walking and interacting with the model, create virtual sections, update information and provide filters to previously loaded graphical and digital consultations.

Figure 1 shows a selective filtering example applied to a Spanish medieval church, according to GEA et al (2015).

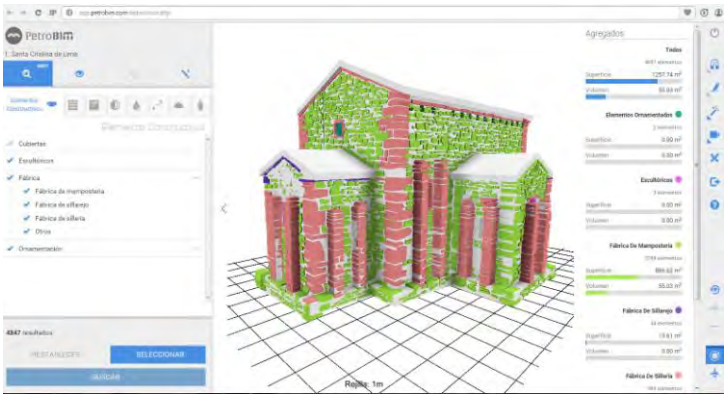


Figure 1. Santa Cristina de Lena. Romanesque Asturian church

* Corresponding author: A. Armisen alberto@petrobim.com

ELEMENTAL MAPPING BY MEANS OF THE INFN-LABEC XRF SCANNER OF A PAINTED CRUCIFIXION BY SIMONE MARTINI

Mazzinghi, A.[1,2*]; Ruberto, C.[1,2,3]; Czelusniak, C.[1,2]; Palla, L.[4]; Castelli, L.[1]; Gelli, N.[1]; Giuntini, L.[1,2]; Mandò, P.A.[1,2]; Taccetti, F.[1]

[1] INFN, Sezione di Firenze, Sesto Fiorentino, Firenze, Italy, [2] Dipartimento di Fisica e Astronomia, Università di Firenze, Sesto Fiorentino, Italy, [3] Dipartimento di Chimica, Università di Firenze, Sesto Fiorentino, Italy, [4] INFN, Sezione di Pisa and Dipartimento di Fisica, Università di Pisa, Pisa, Italy

X-Ray Fluorescence (XRF) analyses are now widespread in the field of Cultural Heritage diagnostics, and in particular regarding the material composition characterization of the artworks, as they allow for multi-elemental, non-invasive and non-destructive in situ analyses (Trentelman et al., 2010; Kriznar et al., 2014). In the recent years, the LABEC laboratory of the INFN in Florence, which has a long-standing experience in this field, has improved the "traditional" XRF implementing a second-generation spectrometer. As well known, "traditional" XRF analyses allow obtaining an X-ray spectrum of the elemental composition of a single-spot of the artwork. This can result in misleading information on the composition of the material, since in most of the case studies the composition of even apparently uniform areas is non-homogeneous at a sub-millimetric scale. This is why reconstructing elemental maps over an area, obtained by a scanning instrument, leads to achieving much more significant and reliable results.

The INFN-LABEC spectrometer was developed with this purpose which is the possibility of obtaining elemental distribution maps over a chosen area of interest. The system consists of a measuring head (X-ray tube, detector, laser pointing system and a camera) placed on motorized linear stages that can be moved on the horizontal and vertical directions. The software that controls the scanning movement and the data acquisition, "synchronizing" them in order to build elemental maps from the area of interest, has been completely designed and implemented in our laboratory. The entire system is remotely controlled and has a radio-safety system.

Thanks to the collaboration with the Opificio delle Pietre Dure, a leading Institution in the field of art restoration in Europe, we had the opportunity to use our prototype for the analysis of many paintings by Old Masters (Ruberto et al. 2016), one of which is the *Crocifisso* by Simone Martini at the Chiesa della Misericordia in San Casciano, near Florence. In this case the XRF scanner has proven to be of great help in unambiguously characterising the original painting palette, the restoration areas and materials, and the gilding technique. The main results will be reported in order to show the performance of the instrument and the main advantages of using a scanning device.

C K. Trentelman et al., The examination of works of art using in situ XRF line and area scans, X-Ray Spectrometry, 39 (2010) 159–166.
A. Kriznar et al., Non-destructive XRF analysis of selected Flemish panel paintings in the Fine Arts Museum of Seville (Review), Journal of the Institute of Conservation 37, 2 (2014) 136-151.
C. Ruberto et al., Imaging study of Raffaello's "La Muta" by a portable XRF spectrometer, MicrChem. J., 126, 2016, 63-69.

* Corresponding author: A. Mazzinghi mazzinghi@fi.infn.it

DEVELOPMENT OF NANOSTRUCTURED COATINGS FOR THE PROTECTION OF TEXTILES AND PAPER

Mazzon, G.[1*]; Zanocco, I.[1]; Zahid, M.[2]; Bayer, I.[2]; Athanassiou, A.[2]; Falchi, L.[1]; Balliana, E.[1]; Zendri, E.[1]

[1] Università Ca' Foscari, Venice, Italy, [2] Smart Materials, Istituto Italiano di Tecnologia IIT, Genoa, Italy

Textiles and paper are cellulosic materials prone to severe decay if exposed to an aggressive environment and more importantly when exposed to water in all its forms. The purpose of this research is to develop water-repellent treatments based on environmentally approved fluoro-acrylic co-polymer nanosilica composites, suitable for the conservation of paper and textiles. The products and treatments must fulfil the requirements of physico-chemical and aesthetical compatibility as only slight changes to hygroscopic behavior and appearance are allowed.

Different formulations were tested by diluting a commercial waterborne fluoro-acrylic co-polymer at different concentrations (2%, 3% 4%, 5% by weight), and admixing it with hydrophobic silica nanoparticles (functionalised with 1,1,1-trimethyl-N-(trimethylsilyl)-silanamine,0.125% and 0.250% by weight. In order to reduce surface tension for better impregnation, methanol as well as less toxic acetone, and ethanol were tested. The resultant treatment performances have been also compared to treatments made by polymethyl methacrylate (PMMA) and polydimethylsiloxane (PDMS) polymers.
The different products were sprayed onto 5 types of canvas (also with preparation layer), books from the 1920's and common white paper, then cured at T=60°C for two hours. Visual appearance (determined by optical microscopy M.O. and CIE_L*a*b* colours variations), water-repellency (by contact angle measurement), vapour permeability, hygroscopic and mechanical behaviour were assessed on specimens before and after one month of artificial ageing under UV lamps (13.6W irradiated between 315 and 400nm and 3.0W irradiated between 280 and 315nm). Microstructure and surface composition of the treated specimens were investigated by ATR-FTIR and SEM-EDX.

High contact angle values (130°-150°) were measured on treated surfaces highlighting the fact that fluoro-acrylic, PDMS and PMMA formulations were effective in reducing the liquid water/surfaces interaction. Moreover, no notable variations were observed by M.O. and colorimetric measurements on specimens treated with PDMS or fluoro-acrylic polymer with nanoparticle concentrations lower than 0.125%. On the contrary, the use of PMMA and fluoro-acrylic polymer with 0.250% nanoparticles resulted in a glossy surface or in a visible whitening of paper and textiles, respectively. SEM analysis showed that fluoro-acrylic products did not create a continuous vapour-blocking film, but they covered the single fibres, thus ensuring a good breathability and vapour permeability of treated samples. Slight variations in the tensile strength measurements were observed, in particular for paper. Artificial ageing with solar lamps did not affect the fluoro-acrylic based formulations. On the contrary, the comparison between treated and untreated specimens after ageing indicates that untreated samples change colour. The treatment is therefore effective in reducing surface wettability, maintaining similar permeability and appearance and protecting the surface from oxidizing action of UV–rays. Further testing is underway to evaluate long-term behaviour and longer ageing times.

* Corresponding author: G. Mazzon 839824@stud.unive.it

STUDY CASE ON NEW MEDIA ART CONSERVATION, EVOLUTION AND DEGRADATION FROM THE ARTWORK TO THE DEMO ARTWORK

Mellado Martínez, D.[1*]; García Morales, L.[2]

[1] HelpMeImFamous! (New media art production and conservation), Madrid, Spain,
[2] Universidad Politécnica de Madrid (UPM), Madrid, Spain

This paper describes the study case of producing a new media artwork as its first form of restoration and conservation. The approach used is similar to the one described by Dr. Lino García Morales (García, 2012). It shows what the future life of the artwork could be and its possible degradation, turning the artwork into a demonstration of the artwork.

Cannula (2016), by Daniel Canogar, was developed taking into account a framework for its conservation. Three measures were contemplated: production as a first measure of restoration, evolution as a conservation tool and reinterpretation as a form of restoration.

The production began with an abstract idea of the object-symbol -a reflection on the accumulation of knowledge, the liquid society and the use of videos as an alternative painting palette- implemented on a medium, that is, a specific object-system: a software combining videos obtained from a specific online repository -YouTube- into an abstract image.

According to the definition of object-system, decisions that affect their implementation were taken. When considering the artist preservation of his work, understood as its durability over time, the implementation of the object-system is also affected. The implementation of the object-system must be faithful to the artist's conception of the object-symbol and, at the same time, adequate to be preserved. An abstract system was conceived, based on functional units and links that describe the system and it components at all levels, both those that visually define the object-symbol and, especially, those that cannot be seen, but support the object-system –software pieces. This atomic description allows the replacement of each item by another that is equivalent, which allows the conservation of the artwork through its evolution and even its reconstruction using different technologies.

All the conclusions necessary for the evolution and conservation are presented in the manual of the art installation, which is delivered together with the artwork. This document works as a guide on how to install and operate the artwork but also as a document detailing it systematic conception for its conservation and restoration.

In any case, there is an element impossible to substitute or reconstruct: the chosen repository. If the selected source –YouTube- disappears, the work ceases to exist as it was conceived. The artwork can mutate into a demonstration version of the artwork, using previously stored contents. This demo version would not be the artwork, but would work as a special case of documentation. Like any art documentation, this version would be valid to present how the work was, using the same interface of the original work. This paper wants to show that this degradation could be considered in the conservation and restoration of the artwork as novel an interesting way of showing what artworks were.

García, Lino. Recreación. Una estrategia de Conservación Evolutiva del Arte Digital. 13ª Jornadas de Conservación de Arte Contemporáneo. Museo Nacional Centro de Arte Reina Sofía. Madrid 2012.

* Corresponding author: D. Mellado Martínez diego@helpmeimfamous.com

CHARACTERISTICS OF METALLIC TREADS OF TEXTILES IN RELIGIOUS COLLECTION OF MINAS GERAIS STATE - BRAZIL

Mendes, I.C.[1]; Coppola, S.A.A.[2]; Boniek, D.[3]; Santos, A.B.[4]

[1] Department of Chemistry - ICEx, Federal University of Minas Gerais, UFMG, Brazil; [2] School of Fine Arts, Federal University of Minas Gerais, UFMG, Brazil; [3] Institut for Biological Sciences, Federal University of Minas Gerais, UFMG, Brazil; [4] School of Engineering and Architecture – Mining Foundation for Education and Culture, FUMEC University, Minas Gerais, Brazil

Among the significant collection of the Archdiocese of the city of Mariana, Minas Gerais, stand out the sacred vestments and liturgical clothing. The most part of this collection are made in wrought silk, such as brocades, damasks, satins embroidery among others. These textile objects, designed to serve the sacred cult of religious brotherhoods show great beauty of colors and ornamental patterns, one extraordinary technical finesse of execution. Mostly coming from Lisbon, these fabrics come from the most sophisticated European textile workshops of the eighteenth and nineteenth centuries. In these collections are woven brocades, llamas and elaborate embroidery, where metallic thread or twine yarn of diverse categories compose the textile structure. Sequins, bugle beads and other metallic elements, result in sophisticated works of embroidery and applications. The use of metallic threads in the composition of textile genres predates the use of silk, occurring mainly in the ornamentation of wrought fabrics intended to religious and noble costumes, but also present in medieval tapestries.

These metallic threads or laminae were commonly made of metal alloys of different compositions of gold, silver, copper or even zinc. The manufacturing of these yarns has developed a wide class of techniques, resulting in specific characteristics that gave rise to totally diverse effects. Effects such as beaded twine, granite threads, fantasy, often being employed together in a same fabric, providing greater refinement to the ornament. Spanish documents from eighteenth century describe the various categories of metallic threads more commonly employed in fabrics that are produced there. The study of the materials and techniques, allow to establish analogies with metallic thread categories described in the texts and found in brocades textiles of the collections of the state of Minas Gerais.

This study aims to identify the composition and techniques used in the metallic threads and laminae found in the textiles from the Archdiocesan collection. Therefore, measurements with X-ray fluorescence were taken to determine composition of the threads. Samples were collected using sterile scalpel, and analyses by optical and scanning electron microscopy were performed to characterize the metallic threads. We seek with these procedures establish the materials and techniques used.

* Corresponding author: I. Mendes isoldacmendes@gmail.com

TOWARDS AN INCLUSIVE AND HOLISTIC APPROACH TO HERITAGE CONSERVATION. THE EXAMPLE OF TRADITIONAL BUDDHIST PRACTICES

Miranda, M.M.*

Archaeologist, Canas de Senhorim, Portugal

Buddhist texts and traditions reveal that heritage conservation is a customary practice. Religious buildings are renovated regularly according to certain principles and using long-established techniques which demonstrate the great awareness of Buddhist communities for conservation. Such renovations have the objective of preserving the cultural significance and functions of buildings rather than their material aspects, often radically transforming them to serve present needs or simply to embellish buildings, giving them renovated and contemporary features. This idea of continuity ensures the preservation of traditional values and the communities' association with their heritage. This also means that present generations have both the right to use their heritage and the obligation to care for it. Here, conservation is a *performance* rooted in worldview, religion and everyday life practices that in reality is more connected to the communities than with the actual building.

Western approaches to conservation have been extensively criticised for putting too much emphasis on the material aspects of buildings. As reflected on the World Heritage Convention, heritage is identified exclusively with buildings, urban areas and archaeological sites, usually architectonically imposing and artistically unique, which reveal a restricted perception of heritage that derives from European aesthetic notions and monumental cultures. These approaches are also based on the notion that heritage is embedded in the material fabric, deemed original and authentic, and thus this should be preserved and conveyed to future generations, for their benefit, because a sense of identity is created when they are presented with this common past. Moreover, only 'experts' have the right to use and take care of heritage because only they have the knowledge and the ability to educate the community. Consequently, they are the ones who claim to them the right to (re)create and (re)interpret the meanings of heritage. This contemporary and 'universalised' practice is disengaging communities from having an active participation in heritage-related activities as these do not have a key role in its conservation and are simply managed as 'public'. New recent approaches, intended to be based on communities' values have been in fact more concerned with their economic development through the involvement of communities in tourism activities and training in crafts and restoration techniques, thus maintaining an emphasis on materiality. Emotional and spiritual connections with monuments and traditional conservation practices are still overshadowed despite being part of living cultures.

My intention is to spur the debate on topics usually put aside by demonstrating there are other equally valid discourses on heritage and conservation, and so, to call for an open-minded and holistic concept of heritage and to culturally relevant and inclusive approaches to conservation that move away from a regime of authenticity, aesthetics and materiality to one that privileges the dynamic and participative character of culture and communities' processes of identity construction and sense of place. Can the Buddhist concept of heritage conservation improve the design of contemporary community-centred approaches, making them more inclusive in a way they really respond to communities' needs and values, combining both development and tradition? I believe young generations should be encouraged to design approaches that put emphasis on creativity and their connections with the milieu by reinterpreting the meaning of the past in their present lives.

* Corresponding author: M.M. Miranda marcelo.m.miranda@hotmail.com

POLYOXOMETALATE-ENCAPSULATED NANOPARTICLES AS ANTIMICROBIAL MATERIALS FOR CULTURAL HERITAGE PRESERVATION

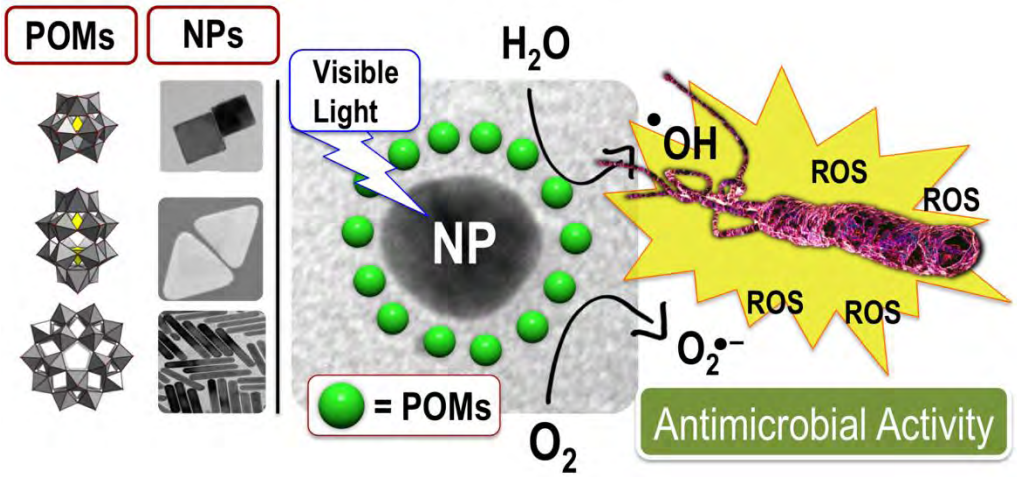
Mitchell, S.G.[1*]; De Matteis, L.[2]; M. de la Fuente, J.[1]

[1] *Instituto de Ciencia de Materiales de Aragón (ICMA-CSIC), Zaragoza, Spain,*
[2] *Instituto de Nanociencia de Aragón (INA), Universidad de Zaragoza, Spain*

Microorganisms are highly proficient at inhabiting and decaying paper, leather and stone objects, generating serious problems for the conservation of paintings, textiles and sculptures. The associated health risks coupled with the cost of decontaminating infected artefacts, exhibition rooms and depots make this a pertinent topic for museums, local authorities and private collectors alike. Moreover, our shared cultural heritage is a social, economic and environmental resource for Europe (Sterflinger and Piñar, 2013). Our aim is to engineer novel nanohybrid materials with enhanced antimicrobial properties that will act as biocidal agents to help prevent biodeterioration in objects of cultural heritage.

Here we show how modular and highly processable hybrid materials can be constructed from the combination of three component parts: nanoparticles (NPs), polyoxometalates (POMs) and polymeric materials (De Matteis et al., 2014). The ability to tailor each of these three constituents offers a unique opportunity to produce precision biocides (e.g. laser-/photo-active nanomaterials) that meet the specific needs of cultural heritage conservation (e.g highly applicable colourless gels, waxes, sols etc.) (Herrmann et al). We propose a comprehensive antimicrobial functional screening programme to assess the activity of these materials against bacterial and fungal strains commonly found infecting objects of cultural heritage.

Ultimately the most active and applicable nanohybrid candidates will be evaluated against biodeteriorative microorganism contaminants on paper, leather and stone surfaces in the laboratory (*'proof-of-concept'* surfaces) as well as in real cultural heritage objects from libraries and museums.



Sterflinger, K. and Piñar, G. 2013. Appl. Microbiol. Biotechnol., 97, 9637–9646.
De Matteis, L.; Mitchell, S. G. and M. de la Fuente, J. 2014. J. Mater. Chem. B, 2, 7114-7117
Herrmann, S.; De Matteis, L.; Mitchell, S. G. and Streb, C. (under review).

* Corresponding author: S.G. Mitchell scott@unizar.es

APPLICATION ASSESSMENT OF NANOSILVER TREATMENT FOR CONSERVATION OF HISTORIC WOODS AGAINST WHITE ROT DETERIORATION

Mohammadi Achachluei, M.[1*]; Vatankhah, G.[1]; Enayati, A.A.[2]

[1] Faculty of Conservation, Art University of Isfahan, Isfahan, Iran, [2] Faculty of Natural Resources, University of Tehran, Tehran, Iran

Wood has been extensively used in historic and cultural monuments, which is capable to decay due to its organic nature. White rot is one of main biodeterioration factors of wood. Preservation of wood against rotters has been significantly studied with industrial viewpoint but it is required to study appropriate treatments according to heritage conservation purposes. Therefore, nanosilver was studied for treatment of historic wood against white rot decay. Wood samples were made from wooden part of a historic building which had been replaced with a new piece of wood during restoration process. The wood species has been identified as oriental plane wood (*Platanus orientalis* L.). The wood was cut to obtain laboratory samples. The samples were treated with nanosilver and visual change was assessed. The samples were incubated for 14 weeks in 23±2 °C temperature and 65% relative humidity under effect of rainbow fungus (*Trametes versicolor*) as a simultaneous white rotter by the Kolle flask method according to BS EN 113:1997. After incubation, mass loss and surface hardness of samples were measured and degradation was evaluated in chemical and morphological aspects. CIE Lab method was applied for assessment of visual changes. Fourier transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM) were used to study of chemical and morphological structure respectively.

Results showed that nanosilver has no significant effect on the visual properties of the wood. Also, visual properties have not changed in treated samples after incubation in comparison with untreated ones. Comparison of treated and untreated samples indicated the minor mass loss of nanosilver treated wood under effect of the fungus. Brinell hardness perpendicular to tangential surface considerably reduced in untreated wood due to white rot affect, despite of treated objects. White rot caused to severe decay in untreated samples that localized on lignin in middle lamella layer of wood microstructure. It indicated protective effect of nanosilver treatment and its potential for conservation of historic woods against white rot degradation.

British standard, BS EN 113. 1997.Wood preservatives. Test method for determining the protective effectiveness against wood destroying basidiomycetes. Determination of the toxic values.

* Corresponding author: M. Mohammadi Achachluei mohsen.mohammadi@aui.ac.ir

STUDY OF STRUCTURAL CHANGE IN WHITE POPLAR WOOD DUE TO THREE CONSERVATION TREATMENTS (DIETHANOLAMIN, BENZOTRIAZOLE AND BIS[2-HYDROXY-5-T-OCTYL-3-(BENZOTRIAZOL-2-YL)PHENYL] METHANE) AND THEIR STABILITY AGAINST LEACHING

Mohammadi Achachluei, M.[1*]; Ahmadi, H.[1]; Pourtahmasi, K.[2]

[1] Faculty of Conservation, Art University of Isfahan, Isfahan, Iran, [2] Faculty of Natural Resources, University of Tehran, Tehran, Iran

Many historic woods have been located in open air spaces under effect of environmental conditions. Prevention from degradation has a great importance for conservation of these woods. Many different materials have been applied for treatment of historic woods in conservation procedures. Structural change in wood by treatment is undesirable and treatment materials have to be stable during the time. Leaching of treatment from wood reduces its efficiency against degradation. It occurs often due to rainfall. Therefore, leaching of treatments is considerably important for conservation of historic woods in open air spaces. In this viewpoint, visual and structural effects and leaching of different treatments were studied. The treatments included Diethanolamin (10% solution in ethanol), Benzotriazole (2% solution in water) and bis [2-Hydroxy-5-t-octyl-3-(benzotriazol-2-yl)phenyl] methane (2% solution in toluene). White poplar wood (*Populus alba* L.) was used for preparation of test samples, because of its widespread application in historic monuments. Wood samples were treated and their adsorptions (impure and pure) were calculated. Visual effect of treatments was evaluated by CIE Lab colorimetry method. pH values of compounds and treated samples were measured. Attenuated total reflectance Fourier transform infrared spectroscopy (ATR-FTIR) was applied to study structural change of wood due to treatment. Leaching of treatments was assessed according to BS EN 84:1997. Results showed that maximum adsorptions obtained in Diethanolamin treatment despite of minimum adsorption of BTA. The treatments did not show very great change in visual aspects and bis[2-Hydroxy-5-t-octyl-3-(benzotriazol-2-yl)phenyl] methane has a minor effect. All compounds and treated woods were little alkaline. Considerable change in wood structure just was detected in Diethanolamin treatment. Reactions of Diethanolamin and wood biopolymers were localized in the hemicellulose and lignin. According to the results, there is not complete leaching of treatments from the wood but their efficiency against different decay factors should be studied. Moreover, reaction of Diethanolamin with hemicellulose and lignin is not destructive and could have the ability to protect the wood.

British Standard, BS EN 84. 1997. Wood preservatives. Accelerated ageing of treated wood prior to biological testing. Leaching procedure.

* Corresponding author: M. Mohammadi Achachluei mohsen.mohammadi@aui.ac.ir

GUNSTONES: ARE NATURAL OR CRAFTED STONES?

Molina, E.[1*]; Cultrone, G.[1]; Sánchez-Quirante, L.[2]

[1] University of Granada, Granada, Spain, [2] Archaeological Museum of Baza, Baza (Granada), Spain

We present the preliminary results about "*gunstones"* (cannonballs made of stone) from the collection of the Archaeological Museum of Baza -MAB- (Granada, Spain) and used in the conquest of the city of Baza in 1489 by the Catholic Kings. This study started when an anonymous neighbor brought to MAB some photographs showing natural stone samples (blocks) with a perfect spherical shape (Fig. 1) in their original outcrop and saying that of which some were used as gunstones. Furthermore, these photographs showed that the blocks have different morphologies (predominantly spherical shape) and different sizes ranging from 10 cm to 1.5 m in diameter, approximately. Unfortunately the source area was not revealed. On the basis of these photographs, the gunstones deposited at MAB could be divided in two types: one of them with clear notches made by the chisels (fig. 2-left) versus other samples without such toolmarks (Fig. 2-right). In this study, we have performed a geological characterization of the latter type of gunstones (without toolmarks) aiming at identifying their source area.

In hand sample, the sandstone appears as medium- to fine-grained sandstone. The color of the stone is ochre with some reddish and yellowish zones. Some mollusk shells and areas with oriented clasts are observed. On fresh cut, a reddish edge (oxidated) is seen enveloping a grayish core, as well as fragments of mollusk shells, orbitolinidae and muscovite grains. Optical microscopy revealed that the sandstone is mainly composed of angular to subangular quartz grains and well sorted. The secondary mineralogy is characterized by calcite, muscovite, k-feldspar and plagioclase. Finally, opaques, biotite and chalcedony were identified as accessory minerals. We also identified the mollusk shells, orbitolinidae, miliodidae and gasterops. The matrix is composed of micrite. The pores are difficult to distinguish in that they are small and there are very few of them (estimated porosity is less than 3%). Finally, based on the petrographic study and the age determined by the fossil assemblage (Cretaceous), we have found a high similarity with "*reworked marine sandstone concretions*" described by García-García et al. (2013). It is thus likely that the source area of these spherical natural sandstones is the Cerrajon formation, near Bedmar (Jaen, Spain), where the armies collected them and applied them as gunstones.

Figure 1. Original source area

Figure 2. Gunstones with (left) and without (right) notches made by chisel

García-García, F., Marfil, R., De Gea, G.A., Delgado, A., Kobstädt, A., Santos, A., Mayoral, E. 2013. Reworked marine sandstone concretions: a record of high-frequency shallow burial to exhumation cycles. Facies 59, 843-861.

* Corresponding author: E. Molina molinap@ugr.es

FRANCISCAN CONCEPTIONIST CONVENT BRICK AND MASONRY WALLS HYGROTHERMAL STUDY (TOLEDO, SPAIN)

Moll Dexeus, A.[1]*; Azpilicueta Astarloa, E.[1]; Acha Román, C.[1]; Rojas Rodríguez-Malo, J.M.[2]

[1] Construction and Technology Department, Polytechnical University, Madrid, Spain,
[2] Archaeological Activities S.L., Toledo, Spain

The abundance and quality of Toledo's (Spain) historical architecture, place this World Heritage City in a continuous restoration and rehabilitation process. The sustainability and optimization of these transformations require new interdisciplinary approaches. Among them, research on the brick and masonry Toledo's walls hygro-thermal behaviour is currently being developed. This kind of fabric is typical from X to XIX centuries Toledo's architecture. It presents different configurations throughout its historical evolution, which have been classified by Rojas and Villa (1997) into five types, depending on the number of masonry courses and brick bands. In order to consider this variety, the research has been focused on a group of buildings that, due to their long construction time, contain walls of different composition and chronology: the Franciscan Conceptionist Convent in Toledo. Built in two stages: the Franciscan (XIII-XV centuries) and the Conceptionist (XVI century), it includes three types of brick and masonry walls, representative of the evolution of this kind of fabric.

A hygro-thermal behaviour monitoring of several brick and masonry 60-80 cm thick walls is being carried out in the Franciscan Conceptionist Convent since February 2016. The tracking is being carried out with non-destructive techniques during one year. The measuring equipment includes, among other instruments, thermal imaging cameras, dataloggers, transmittance meters and solar radiation meters.

Data collected so far between February and May 2016 show 8 to 14 °C outside temperature daily oscillations and 70-80% average outside relative humidity. Under these conditions, the wall's inside surface temperature and the indoor air temperature remain fairly constant, with variations minor to 1ºC. The outer surface temperature ranges 6 to 16 °C, depending on the wall's orientation and sun exposure. The results suggest the reversal of the outside heat flow direction soon after it has reached the wall's interior.

Surface thermal behaviour differences among wall materials: masonry, brick, and lime mortar, have also been analysed. In the early hours of the morning and in the afternoon, maximum temperatures are located in masonry areas and minimum temperatures in brick bands. At noon, this relationship is reversed in 80% of the studied walls. These results are consistent with higher heat capacity and conductivity of masonry, relative to brick.

Over the coming months, new data will be collected in the Franciscan Conceptionist Convent monitoring; that will facilitate the understanding of the brick and masonry walls hygro-thermal behaviour. Traditional walls energy performance knowledge is essential for the sustainability of future conservation and restoration actions in heritage buildings.

Rojas , J.M.; Villa, J.R., 1997. Origen y evolución del "aparejo segoviano" entre los s.X y XVI. Actas del II Congreso de Arqueología Peninsular, 583-58 (errata: figura "segoviano" en lugar de "toledano").

* Corresponding author: A. Moll Dexeus estudio@annamolldexeus.com

CONSOLIDATION AND REINTEGRATION OF BURGOS CATHEDRAL AFTER THE DEMOLITION OF THE ARCHBISHOP'S PALACE, BURGOS, SPAIN

Mora Moreno, I.*

Departamento de Construcción y Tecnología Arquitectónicas, Escuela Técnica Superior de Arquitectura de Madrid (Universidad Politécnica de Madrid), Spain

With the demolition in 1914 of the Archbishop's Palace (originating in the thirteenth century), of the set of Burgos Cathedral (World Heritage Site in 1984), Chief Architect of the Cathedral Vicente Lampérez and Romea, had to collect all attempts demolition that took place from the mid-nineteenth century, according to advocates, embellishing the Cathedral and getting new perspectives of the monument; join his restoration criteria (in an era with marked differences between the various theories of restoration and opponents to the isolation of monuments); deal with major problems of consolidation and the emergence of important elements that modify the project; and find it necessary to justify due to the popular pressure, his performance.

By studying the consolidation that has to perform Lampérez, a work with an aesthetic purpose which became solving major structural problems and reintegration, through a contextual analysis of the restoration (in the same year consolidation of Patio del Yeso in Reales Alcázares of Sevilla is performed), and using non destructive techniques for evaluating the new elements introduced in the restoration and comparing them with constructive and material resistance studies, result the initial errors to avoid and how Lampérez solves them, and therefore a better understanding of the behavior of the masonry.

*Corresponding author: I. Mora Moreno nachomoramoreno@gmail.com

SINGLE-SIDED NMR: A NON-INVASIVE DIAGNOSTIC TOOL FOR ASSESSING THE EFFECTS OF SOLVENT CLEANING ON PAINTING LAYERS

Moretti, P.[1,2*]; Rehorn, C.[3]; Zia, W.[3]; Cartechini, L.[2]; Blümich, B.[3]; Miliani, C.[2]

[1] Dipartimento di Chimica, Biologia e Biotecnologie, Università degli Studi di Perugia, Italy, [2] Istituto CNR di Scienze e Tecnologie Molecolari (CNR-ISTM), Perugia, Italy, [3] Institut für Technische und Makromolekulare Chemie (ITMC), RWTH-Aachen University, Germany

During cleaning of painted surfaces the use of solvents to remove undesired materials such as varnish, overpaints or degraded coatings is a common practice. Over the last fifteen years, a large number of gel-based cleaning formulations has been developed in order to minimize the penetration of solvents into underlying paint layers and to reduce their potential negative effects such as swelling, softening and leaching. As a consequence there is the interest to quantify analytically the degree of solvent penetration for different cleaning formulations. Recently, a novel approach based on the use of non-invasive single-sided Nuclear Magnetic Resonance (NMR) to monitor solvent penetration and relative physical changes in softness, stiffness and elasticity of painting layers was developed (Angelova et al, 2016 and ref.s therein), highlighting the potential of this technique.

A comparative study of solvent ingress due to free solutions and gels into a variety of paint films was performed using single-sided NMR. To this aim, simplified paint models were prepared by applying different binders (linseed oil, whole egg, acrylic, vinyl and modern oil) and pigments (lead white, titanium white and ochre yellow) on both glass slides and canvas strips. A thin finishing layer of varnish was added only to linseed oil and whole egg paints. For cleaning tests, ligroin was selected for the paint layers made of traditional binders, while an aqueous system (ammonium citrate tribasic added to water) for the modern ones. Both solvents, in pure as well as in gel form, were applied to the surface of each mock-up sample by cotton swabs, while their diffusion into the paint layers was evaluated with NMR-MOUSE (MObile Universal Surface Explorer), a single-sided NMR sensor. Depth profiles revealed information about the proton density and transversal relaxation time T_2 before and after the cleaning treatments at regular time intervals. The depth of solvent ingress is most clearly seen from the proton density profile. The transversal relaxation time T_2 provides insights into physical properties and mobility in the paint layers. The results obtained from the investigations show the potential of NMR in elucidating differences between solvent-based treatments and validate the utility of this technique as a non-invasive diagnostic tool for assessing the effects of cleaning-solvents on paintings.

Acknowledgments: This research was supported by the H2020 project IPERIONCH (INFRAIA-2014-2015 Grant No. 654028)

Angelova, L. V.; Ormsby, B.; Richardson, E. 2016. Diffusion of water from a range of conservation treatment gels into paint films studied by unilateral NMR. Part I: Acrylic emulsion paint, Microchemical Journal, 124, 311-320.

* Corresponding author: P. Moretti moretti.patrizia86@gmail.com

CONSOLIDATING TREATMENT OF CARBONATIC ROCKS BY USING DIAMMONIUM HYDROGEN PHOSPHATE (DAHP): INFLUENCE OF APPLICATION TECHNIQUES ON THE PENETRATION DEPTH

Murru, A.[1*]; Fort Gonzalez, R.[2]; Meloni, P.[3]

[1] Dipartimento di Ingegneria Civile, Ambientale e Architettura, Cagliari, Italy, [2]Instituto de Geociencias (CSIC, UCM), Madrid, Spain, [3] Dipartimento di Ingegneria Meccanica, Chimica e dei Materiali, Cagliari, Italy

The diammonium hydrogen phosphate (DAHP) has been recently proposed as an inorganic consolidant to favor the formation of calcium phosphates, mainly hydroxyapatite (HAP), (Sassoni et al., 2011). The objective is to obtain a stone consolidating material suitable to restore the decayed carbonate rocks, making up the building structures of historical-architectural interest.

A fundamental parameter, for assessing the effectiveness of the consolidating treatments, is the penetration depth of the newly-formed strengthening mineral phases, at present not fully under control. According to Franzoni et al. (2015), the methodologies and techniques of application of the consolidant products, as well as the operating conditions, all can play a fundamental role on the outcomes of treatments.

For making a contribution to solve this difficult task, this paper is focused on a systematic experimentation based on the application of aqueous solution DAHP on two different carbonatic lithotypes. Tests were carried out on carbonate lithotypes: Carrara marble (Marmo Statuario Michelangelo) and to a biomicritic limestone, collected in Tuscany and central Sardinia (Santa Caterina di Pittinuri), respectively. These lithotypes are generally greatly affected by alteration phenomena, essentially due to their typical microstructure. Indeed, to different lithotypes correspond different porosity features which can affect, in different way and intensity, the vulnerability and durability of the rocks submitted to the decay weathering agents.

The aqueous solution DAHP was applied on the stone, using three different methodological techniques, for different times: immersion, brushing and poultice. The assessment of the results, in terms of penetration depth, were carried out by mappings acquired using the Scanning Electron Microscope (SEM).

For both lithologies studied, the greatest penetration depth was achieved with the use of poultice: the presence of calcium phosphates was detected up to 5 mm in marble and up to 10 mm in limestone.

Sassoni, E.; Naidu, S.; Scherer, G.W.; N. 2011. The use of hydroxyapatite as a new inorganic consolidant for damaged carbonate stones. Journal of Cultural Heritage 12, 346–355.
Franzoni, E.; Sassoni, E.; Graziani, G.; N. 2015. Brushing, poultice or immersion? The role of the application technique on the performance of a novel hydroxyapatite-based consolidating treatment for limestone. Journal of Cultural Heritage 16, 173–184.

Research funded by Geomateriales 2 (S2013/MIT-2914) and by Erasmus+ Placedoc (A.A. 2014/15).

* Corresponding author: A. Murru ariannamurru@unica.it

STUTTGART MAIN STATION BY PAUL BONATZ: MONUMENT LIFE

Musaio Somma, L.*

University of Basilicata, Department of European Cultures and Mediterranean (DiCEM), Matera, Italy

Stuttgart's main railway station, projected by the German architect Paul Bonatz during first decade of 20th century, has undergone deep transformation processes, during the construction period (1914-28) and post-war reconstruction (1950-60), until the partial demolition within the project underway named *Stuttgart 21*, for modern high speed transport needs.

To get full knowledge of this monument, steps were taken to obtain the graphic reconstruction of the building. All different configurations assumed with time were reproduced, both as a whole, both in the construction details, in order to recall its spaciousness and centrality in its urban context.

It started by classifying original Bonatz drawings in historical phases, through the reconstruction of the parts not represented and the creation of a three-dimensional model, analyzing the technological aspects, it led to the complete reconstruction of the building during each historical period.

The possibility of using the three-dimensional reconstruction of the building as it appeared in historical and modern times, preserving the memory of the now demolished parts, together with the creation of a permanent exhibition of historical photos and drawings that highlight the transformation of the building in relation to the urban context, may constitute an excellent example of the new functions of an "archeology building" linked to the world of transport.

The relevance of the building in the collective memory requires that it continue to be enjoyed even after the construction of the new railway station, not only as a transit hall, but with railway functions. The suggested method would help to disseminate knowledge and memory.

Figure 1 shows the 3D reconstruction of the building, as it appeared in 1928.

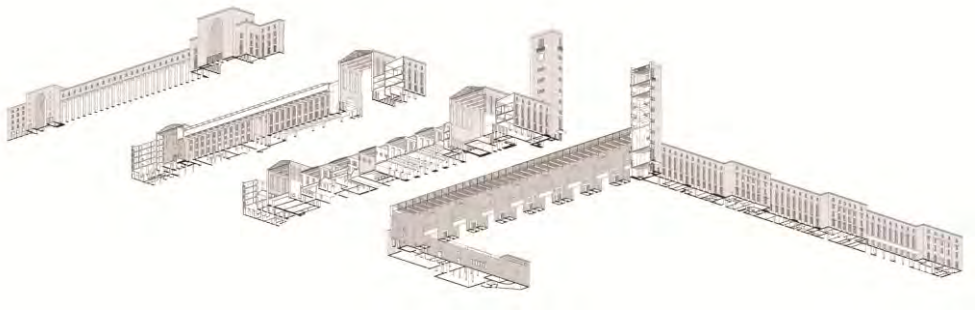


Figure 1. Axonometric section of the railway building at the time of the first version of the building (1928). Drawings by M. Balestra, M. Carbone, L. Fornarelli, F. Franciolapilla, L. Musaio Somma, A. R. Saponara, F. Strada

* Corresponding author: L. Musaio Somma letizia.musaio@unibas.it

DECISION-MAKING PROCESSES OF ANASTYLOSIS PROJECTS AT ARCHAEOLOGICAL SITES THROUGH THE CASE STUDY OF SAGALASSOS IN BURDUR, TURKEY

Mutlu, Ö.*

Sagalassos Archaeological Research Project (KUL), Leuven, Belgium

Archaeological researches and excavations are important tools to reach and interpret the information about the human past. Post-excavation processes for the uncovered archaeological remains are as critical as the archaeological excavations themselves. In order to maintain the condition and restore unearthed archaeological remains, various techniques of conservation interventions may be applied in different scales. Anastylosis is one of the frequently used restoration techniques on archaeological sites, with a potentially powerful impact on the remains themselves as well as on their environment. In this sense, how to decide on an anastylosis project becomes an important part of archaeological heritage management processes.

Since 1991, anastylosis projects have been taking place at the archaeological site of Sagalassos in the province of Burdur, located in the southwest of Turkey. To date, different monuments in varied scales have been reconstituted. In this paper, the experiences of Sagalassos are summarized within the framework of the completed anastylosis projects. These experiences are compared to contemporary archaeological heritage management methodologies focusing on the decision-making processes. The outcome of this comparison reveals not only the complex nature of archaeological heritage and the challenges involved with the planning and managing of the post-excavation processes, but also findings specific to the abovementioned archaeological site.

This paper is derived from a master degree research finished on February 2015 in the department of Archaeology of the University of Leuven (Belgium): "*An Evaluation of Decision-making Processes of Anastylosis in Archaeological Sites. Case Study: Sagalassos*" in the department of Archaeology of Leuven University.

* Corresponding author: Ö. Mutlu mutluozge09@gmail.com

EVALUATING NATURAL HAZARDS AND TOURIST IMPACT ON MOUNTAIN ARCHAEOLOGICAL HERITAGE CONSERVATION IN NÚRIA AND COMA DE VACA VALLEYS (EASTERN PYRENEES)

Olmos, P.[1*]; Furdada, G.[2]; Garcia, A.[1]; Polonio, T.[1]; Palet, J.M.[1]

[1] Landscape Archaeology Research Group (GIAP) Institut Català d'Arqueologia Clàssica (ICAC), Tarragona, Spain, [2] RISKNAT Research Group, Facultat de Geologia, Universitat de Barcelona, Barcelona, Spain

In this work we propose a methodology to evaluate the impact of natural hazards (mainly rockfalls, debrisflows and avalanches) and human pressure to archaeological conservation of cultural landscapes in high mountain areas (Núria and Coma de Vaca valleys, Eastern Pyrenees). To do this, a specific and original methodology for risk assessment has been developed through the collaboration of archaeologists specialized in mountain cultural landscapes and geologists specialised in natural hazards.

Due to the easy access and its well preserved natural heritage, this is one of the most important areas for mountain tourism in Catalonia. In this area, the decline of traditional activities and the touristic pressure has an important impact on the conservation of the archaeological record. Even though the archaeological research attests a high density of structures and sites, a rich archaeological heritage, it is often ignored by tourists and locals. We propose to create a database including information from the visitors, their concentration during specific dates and their most frequent displacements (excursions and short walks), and integrate this information along with the archaeological sites database in a Geographical Information System and to evaluate the potential impact of tourist activities on the conservation of cultural landscape heritage. Moreover, heritage management strategies should be adapted tacking into account regional and local stakeholders, in order to point out the existence and importance of the archaeological sites within this natural space and raise social awareness of this fragile heritage.

Our final aim is to produce cultural heritage itineraries adapted to families and trekkers and promote integrated cultural and natural landscape as a responsible touristic resource.

* Corresponding author: P. Olmos polmos@icac.cat

ANALIZING THE BIOCHEMICAL ALTERATION CAPABILITY OF BACTERIA AND FUNGI IN VERDIGRIS PICTORIAL SPECIMENS USING VOLTAMMETRY OF IMMOBILIZED MICROPARTICLES

Ortiz-Miranda, A.S.[1]; Doménech-Carbó, A.[2*]; Doménech-Carbó, M.T.[1]; Osete-Cortina, L.[1]; Bolívar-Galiano, F.[3]; Martín-Sánchez, I.[4]

[1] Institut de Restauració del Patrimoni (IRP-UPV), València, Spain, [2] Departament de Química Analítica, Universitat de València, València, Spain, [3] Departamento de Pintura, Universidad de Granada, Granada, Spain [4] Departamento de Microbiología, Universidad de Granada, Granada, Spain

The growth of microorganisms in paintings and artworks, in general, is one of the major worldwide concerns in all museums due to the aesthetical and structural damage that it may cause. Until now, a number of analytical strategies based on spectroscopic and chromatographic techniques have been developed that enable the study of the changes undergone by the binders and finishes after microbial attack. Nevertheless, the study of the minimal modifications occurring in both the binder and the pigment is difficult and more selective and sensitive analytical techniques are required.

The application of the voltammetry of immobilized particles (VIMP) (Scholz et al, 2005), an electrochemical technique of solid state to control the deterioration of verdigris-based pictorial specimens under the action of different microorganism is described. The deterioration of pictorial specimens combining *Verdigris* with Arabic gum, egg and egg+linseed oil binders by the bacteria *Bacillus amyloliquefaciens*, *Arthrobacter oxydans* and *Streptomyces cellulofans* and the fungi *Penicillium chrysogenum*, *Aspergillus niger*, *Acremonium chrysogenum*, *Trichoderma pseudokoningii* and *Mucor rouxii* were tested using sample-modified graphite electrodes immersed into aqueous electrolytes (Doménech-Carbó, 2010). A model is presented to describe the involved electrochemistry resulting in the appearance of binder- and biological agent-specific features in the electrochemical reduction of Cu(II).

Acknowledgements: financial support is gratefully acknowledged from the Spanish “I+D+I MINECO” projects CTQ2011-28079-C03-01 and 02 and CTQ2014-53736-C3-1-P and -2-P supported by ERDF funds.

Scholz, F.; Schroder, U., Gulabowski, R. 2005. Electrochemistry of Immobilized Particles and Droplet, Springer, Berlin-Heilderberg.
Doménech-Carbó, A. 2010. Voltammetric methods applied to identification, speciation and quantification of analytes from works of art: an overview. J. Solid State Electrochem. 14, 363-379.

* Corresponding author: A. Doménech-Carbó antonio.domenech@uv.es

AN OVERVIEW OF NANOLIME AS A CONSOLIDATION METHOD FOR CALCAREOUS SUBSTRATES

Otero, J.[1, 2]*; Charola A.E.[2]; Grissom, C.[2]; Starinieri, V.[1]

[1] Materials and Engineering Research Institute, Sheffield Hallam University, Sheffield, UK, [2] Conservation Museum Institute, Smithsonian Institute, Washington DC, USA

The conservation of historic structures is currently undergoing a change because of newly-developed technologies for the production of nanomaterials. These materials are characterized by the small size of their particles —in the nanometer range, changing their material properties to allow new applications. One example of a nanomaterial developed over the last decade is the so called "nanolime", nanoscale particles of $Ca(OH)_2$, with potentially superior consolidation properties compared to traditional lime based treatments.

The nanolime treatment is similar to the traditional limewater technique. However, the traditional technique has some limitations, such as the low solubility of $Ca(OH)_2$ and the deterioration of the stone substrate associated with application of large amounts of limewater solution. The use of lime nanoparticles allows incorporating larger amounts of lime into the treated substrate with far less water. The nanolime particles are applied in alcohol based dispersions in an approach first developed nearly 20 years ago at the University of Florence (CSG Consortium). Since then, the nanoparticle preparation method was modified several times leading to the marketing of products such as Nanorestore® and Calosil®.

Nanolime products have been successfully applied to wall paintings, limestones, lime mortars and renders, in particular as a pre-consolidation treatment to improve surface cohesion. However, when consolidation of the underlying substrate is required, the results vary significantly between materials. The key factors that influence the consolidation process are: 1. the transport of nanolime particles within the pore structure (Borsoi et al., 2015); 2. the effect of the dispersion solvent on carbonation of the nanolime within the substrate (Borsoi et al., 2016); 3. the impact of relative humidity on carbonation (López-Arce et al., 2010); and 4. the influence of the size and morphology on the reactivity of the nanoparticles (Daniele and Taglieri, 2012; Taglieri et al., 2015).

The paper aims to review the nanolime literature to identify areas where more research is needed to elucidate the nanolime consolidation process.

Borsoi, G., Lubelli, B., van Hees. R. (2016). Effect of solvent on nanolime transport within limestone: how to improve in-depth deposition, (May).

Borsoi, G., Lubelli, B., van Hees, R., Veiga, R., Silva, A. S. (2015). Understanding the transport of nanolime consolidants within Maastricht limestone. Journal of Cultural Heritage, 1–8.

Daniele, V., Taglieri, G. (2012). Synthe.sis of $Ca(OH)_2$ nanoparticles with the addition of Triton X-100. Protective treatments on natural stones: Preliminary results. Journal of Cultural Heritage, 13(1), 40–46.

López-Arce, P., Gomez-Villalba, L. S., Pinho, L., Fernández-Valle, M. E., de Buergo, M. Á., Influence of porosity and relative humidity on consolidation of dolostone with calcium hydroxide nanoparticles.Effectiveness assessment with non-destructive techniques. Materials Characterization, 61(2), 168–184.

Taglieri, G., Daniele, V., Re, G. Del, & Volpe, R. (2015). A new and original method to produce Ca $(OH)_2$ Nanoparticles by using an anion exchange resin, (May), 17–24.

* Corresponding author: J. Otero jorge.otero@student.shu.ac.uk, OteroJ@si.edu

INFLUENCE OF NITRATE SALTS ON EVAPORATIVE BEHAVIOR OF HISTORICAL BUILDINGS. THE CASE OF CAPILLA DEL CRISTO IN SANTA MARÍA DE CONXO MONASTERY (SANTIAGO DE COMPOSTELA, SPAIN)

Otero Ortiz de Cosca, R.*; Allegue Castelos, H.; Garcia Morales, S.

School of Architecture, Technical University of Madrid (ETSAM-UPM), Madrid, Spain

This paper reports the research on the "evaporative behavior" of the historical building Santa María de Conxo Monastery (18th century). The Chapel showed dark staining of granite slabs of the floor related to moisture which is common in this region. The monastery has a cementery, with tombs next to the North wall. These tombs could be the cause of the interior damage. Consorcio de Santiago, local responsible entity, decided to build a perimetral drainage system, but the problem remains.

The evaporative behavior was characterized in order to understand the cause of the damage. An *Inspection Protocol* was designed, based on the combination of different non destructive techniques and laboratory surveys. First, damp spots were located by termohigrometer. Afterward, this points were monitored by data loggers -temperature [ºC] and relative humidity [%]- for a year. This survey allows to evaluating the wet and dry cycles of the building.

Salt content mapping and nitrate characterization through laboratory testing of nitrate cycle were made in order to complete the research.

Finally, collected data were statistically analyzed to a better interpretation. The survey combination revealed:

The granite slabs seemed to be affected by a huge amount of water, but the research showed a "normal" water content. The research suggested two main causes of the damage. Aside, a high salt content, which hinders the normal evaporation, combined with the microclimatic environment. The city of Santiago de Compostela with a high level of air humidity most of the year (70, 80 even 90% RH), makes the evaporation more difficult.

Although the problem seemed to come from the cemetery, the major level of damp was in the South wall.

This research, based on a case study, pretends to be a model in order to develop a data processing system for this type of building.

* Corresponding author: R. Otero Ortiz de Cosca roterort@gmail.com

DIALOGUE OF KNOWLEDGE FOR THE CONSERVATION OF CULTURAL HERITAGE

Pacheco, N.*

Instituto Nacional de Antropología e Historia (INAH), Chiapas, México

San Felipe Ecatepec is a community of indigenous origin belonging to the municipality of San Cristóbal de las Casas, Chiapas. Currently the socio-cultural organization is “uses and customs”, so in the community assembly population agrees essential decisions of their daily lives.

This community has a Temple of the early sixteenth century, built by the Franciscan order, who arrived in this period, according to the National Coordination of Historical Monuments (1999). Since 2013, at the request of members of the Committee Pro-Improvement of the Temple and the Board of Mayor (community bodies for the care of the temple and religious festivals organization) conservation activities of the movables in the Temple were made. The first was part of a school practice of National School of Restoration of Mexico, for surface cleaning and conservation of three altarpieces. The second study focused on the stabilization and mural painting found in the apse of the temple , in order to initiate the investigation of pictorial stages that are hidden beneath new layers of paint that have been added later. In 2015 we worked with members of these bodies to maintain the facades of the Temple.

In 2014 a project for the World Monuments Watch program agreed on managing financial resources for the conservation of altarpieces in the region of the highlands of Chiapas, among which are those of San Felipe Ecatepec. The following link describes the aforementioned work:
https://www.youtube.com/watch?feature=youtu.be&v=8AdhiEKRtkA&app=desktop.

All this is organized, managed and disseminated jointly in community assemblies. Conservation activities were supplemented by discussions of education and disseminated for the residents of San Felipe Ecatepec. The main interest of this work is to present the results and highlight the amount of effort and knowledge shared with the villagers who contributed to the successful conservation of their heritage.

Figure 1 shows the main facade of the Temple of San Felipe Ecatepec, after its restoration in 2015.

Figure 1. Temple of San Felipe Ecatepec, San Cristóbal de las Casas, Chiapas

Catálogo Nacional de Monumentos Históricos Inmuebles; Coordinación Nacional de Monumentos Históricos, INAH-CONACULTA, Estado de Chiapas. México 1999. Volumen VII, 131-138.

* Corresponding author: P. Nayeli naynaypp@gmail.com

WHAT TO DO WHEN OWNERS DO NOT KNOW THEY POSSESS A WORK OF ART

Palčić, I.*

Croatian Conservation Institute, Zagreb, Croatia

The subject of this paper is conservation-restoration works done on a concrete sculpture "Tobogan" from 1953-1954, made by Ivan Antolčić. Works were done as the part of the author's Master's thesis, under the Conservation-restoration Department of the Academy of Fine Arts in Zagreb.

The sculpture is in the ownership of a large company from Zagreb and is situated in the backyard of the Hostel "Stoimena" in Crikvenica, the former children's home for which it was made in the first place. It represents a sculpture-slide made for interacting with children, i.e. some form of a multi practical playing device you can climb on, slide down from or go through. The shape is organic and, along with its almost abstract form, it resembles a sea snail making it closer to the marine landscape since it is situated not far from the coast. According to the words of the author of the sculpture, a work of his former school colleagues could also be found near "Tobogan", as well as the ceramics made by students of School for Applied Arts in Zagreb, which he attended as well, which was given as a present to children's home. Unfortunately, there is no documentation that could serve as a proof for the mentioned. "Tobogan" is, therefore, the only preserved work of art produced by the School at that time.

Current owner's unfamiliarity with the fact that the backyard of one of their objects holds the sculpture was a big problem since they had no interest in restoring it. "Tobogan" was in a severely bad state to begin with and the restoration was more than needed. After the long-term negotiation on the cooperation between the Academy of Fine Arts in Zagreb and the owner of the sculpture, cleaning, consolidation, reinforcement of separated parts, reconstruction, retouch and surface protection, as well as checking of materials started. They were carried out on the Faculty of Civil Engineering in Zagreb.

Fifty five years after its appearance, the sculpture was finally restored and today it the witness of its importance and uniqueness. The implementation of concrete in sculpting was rare up until 1950s and among first artists to use it was Henry Moore, Ivan Antolčić's artistic role-model. Moore made sculptures from cast concrete using traditional technique of casting in plaster sculptures. The same technique was used for the making of "Tobogan". By following current artistic trends of the time Antolčić succeeded in making the unique sculpture which impresses with its modernity, applicability and material that can rarely be found in sculpting masterpieces in Croatia.

Figure 1. Tobogan

*Corresponding author: I. Palčić inespalcic@gmail.com

INFRARED TERMOGRAPHY AS A TOOL FOR THE STAINED GLASS WINDOWS CHARACTERIZATION

Palomar, T.[1*]; Agua, F.[2]; Villegas, M.A.[2]; Gomez-Heras, M.[3]

[1] Research Unit VICARTE- Glass and Ceramic for the Arts (FCT-UNL), Caparica, Portugal, [2] Institute of History. Center for Human and Social Sciences (CCHS-CSIC), Madrid, Spain, [3] Geosciences Institute IGEO (CSIC-UCM), Madrid, Spain

Stained glass windows are complex artworks composed by glasses, which can be painted with grisailles and enamels, mounted on lead cames to form window panels. These cames are usually soldered to each other using a melted tin–lead alloy. To characterize the materials of the stained glass windows, it is habitual to disassemble the different pieces, thus the characterization is commonly carried out during their restoration. In recent years, thermography has been successfully applied to characterize in-situ building materials, mosaics, sculptures, paintings and archaeological materials; however studies on glassy materials are scarce and they are focused on the evaluation of windows for industrial purposes.

In this study we present the results of the characterization of glasses, enamels, grisailles, lead cames and tin–lead welds by infrared thermography in a contemporary stained glass window and in a 20th century stained glass window from the CSIC headquarters in Madrid. The thermographic analysis was carried out with a FLIR ThermaCAM^{TM} B4 (7.5 to 13 µm wavelength range, -20 to +130 ºC temperature range and 0.08 ºC of temperature accuracy) in transmission and reflection modes. The study was carried out by active thermography illuminating the stained glass windows with a spotlight of 500 W during 10 min.

Each material has a different behavior vs infrared radiation. Glasses presented an increase of the apparent surface temperature due to the radiation transmission through them. This temperature abruptly decreased after the illumination in transmission mode. Nevertheless, in reflection mode, the cooling of the glass surface after the illumination was slower due to the surface warming. Metallic materials presented an almost constant apparent temperature in transmission mode because of their low heat capacity; although in reflection mode, tin–lead welds were the most reflective material, increasing their apparent temperature up to three times the original value. In contrast, lead cames presented the lowest variation, which consisted in a slow apparent temperature increasing due to the progressive warming. Grisailles and enamels presented a noticeable apparent temperature increase in both modes due to their warming. The temperature difference between these materials and the supporting glasses can induce the formation of thermal stress, and finally fissures and cracks could arise. Both the glass bubbles and cracks were better observed in transmission mode.

Research funded by Geomaterials 2 (S2013/MIT_2914) Programme.

* Corresponding author: T. Palomar t.palomar@fct.unl.pt

EMERGENCE OF INDIVIDUAL PROFESSIONAL KNOWLEDGE FROM A SYNCRETIC TEACHING COLLECTION

Parisi, F.[1,2*]

[1] *ICCROM, International Centre for the Study of the Preservation and Restoration of Cultural Property, Rome, Italy;* [2] *Polytechnic University of Valencia, Valencia, Spain*

A movable didactic collection of 380 objects has been formed and used by ICCROM in some of its multicultural courses, in the past 14 years (CollAsia programme courses and Communication and Teaching Skills courses). The creation and the use of this collection served as a method of mutual learning in conservation training activities for continuous professional development, showing how objects can stimulate emergence of knowledge.

The objects of the collection are part of the course didactic materials within the course spaces, are made of a huge variety of materials and techniques, and come from different countries all over the world. They have been collected or donated in different occasions and there is no systematic record about their nature and biographies. Many of these objects can be commonly classified as ethnographic or tourist objects; however the collection also includes other types of objects, such as photographs, documents and pop/kitsch modern objects.

The very diversity stimulates debate; partial information gives room for questioning assumptions. What is considered heritage and what not? Connections are made between the private to public, between the archaeological or modern and contemporary. Focus of discussion often revolves around definition and categorization of objects, documentation and information systems, ownership and custodianship, and other collections care issues.

This form of inter-professional training has proved productive: the participants and teachers are mixed in working groups and are given sets of objects. The activity coordinator provides the session's structure. The objects provide the opportunity for wide questioning from both teachers and participants. As the answers to the questions posed are not obvious, the relation's teachers and professional participants become egalitarian, as each person has to use and question their own pre-existing knowledge. Although the actors involved in these training activities have very diverse backgrounds and come from different cultural contexts, they all face the same problems in terms of exploring the evolving nature of this collection and feel challenged to find possible solutions to the collections care problems arising from its use.

Use of a varied and excentric collection of objects facilitates a democratic debate where all participants and teachers become curious and use the group activity of discovery to generate new knowledge applicable to their own working context.

* Corresponding author: F.Parisi flaviaparisi1@gmail.com

EVALUATION OF LED LIGHTING EFFECT ON THE MICROBIAL GROWTH ON HYPOGEA AT THE ARCHAEOLOGICAL PARK OF TIERRADENTRO, CAUCA (COLOMBIA)

Patiño, M.C., Rodríguez, D.; Dorado, J.; Villalba, L.S.*

Research Group Haerentia, Bogotá, Colombia

The Archaeological Park of Tierradentro is an archaeological reserve of Colombia, declared in 1995 World Heritage Site by UNESCO. It is an extensive area with hypogea and statues; hypogea were places used for burials with underground chambers, they were built from tuff and their walls were decorated with anthropomorphic, geometric and zoomorphic designs in red and black pigments over white. Most of them were opened by looters and have a high degree of destruction and decay.

The aim of the study was to evaluate the impact of LED lighting inside the hypogea on the growth of microorganisms. Four hypogea were selected for the study: Hypogeum 30 Segovia, Segovia 28, Segovia 12 and Segovia 9. Recognition and description of biological colonization types according to shape, color and distribution in hypogea were performed taking into account areas with natural-artificial lighting, darkness and the presence / absence of pigments on the tuff. The microbial sampling was performed for photosynthetic (microalgae) and heterotrophic microorganisms (bacteria, yeasts and filamentous fungi). Samples were also collected for Scanning Electron Microscopy (SEM).

The results showed the prevalence of bright green patinas in areas exposed to natural lighting, especially at the entrance of the hypogeum. From these areas were isolated mainly photosynthetic microorganisms. Green biofilms were not observed on the inner walls of hypogea illuminated with LED light, only in hypogeum 9 complex Segovia, green biofilms were observed close to an artificial light source (13cm from the light source).

No significant differences between optical density values from areas with LED lighting and darkness were found, suggesting that the LED light used from long distances and short exposure times do not influence microbial growth. Figure 1 shows an image of the wall painting in the hypogeum, and Figure 2 microalgae isolated.

Figure 1. Wall paintings

Figure 2. Microalgae isolated

* Corresponding author: L.S. Villalba luz2518@gmail.com

APPLICATION OF UAV (UNMANNED AERIAL VEHICLE) AND 3D MODELLING ON CULTURAL HERITAGE. TWO CASE OF STUDY

Pecci A.*; Masini, N.

Consiglio Nazionale delle Ricerche, Istituto per i Beni Archeologici e Monumentali, IBAM-CNR, Tito Scalo (Pz), Italy

The UAV platforms (Unmanned Aerial Vehicle) have entered strongly in architecture and archeology because they are versatile and low cost tools, which allow to survey and image building elements and ground surfaces by innovative vision. Through high resolution videos and photos, the UAVs allow the acquisition of information and data useful for the analysis of the state of conservation, the study of architectural and building details, the evaluation of risks. They are even more useful in the survey of architectural structures that are difficult to detect, inaccessible, unsafe or badly damaged. In addition, through photos taken by UAV platform and processed by using Structure from Motion algorithms is possible to create 3D models of high detail, extremely useful to analyze the crack pattern, to map materials and degradation.

This paper presents the results of the application of UAV on two monuments in Basilicata, Southern Italy.

The first case of study is the sixteenth-seventeenth century castle of Valsinni (Basilicata, Italy), presumably built on a pre-existing medieval fortification. It is famous as it was the home of the poetess Isabella Morra. Due to the orography of the site on which it stands this castle and the danger of perform any kind of survey from the outside, the use of drone proved the only useful tool for the purpose. All the external facades have been surveyed, thus providing a detailed 3D model of the entire castle, including also the archaeological excavation on going in the interior courtyard.

The second case study is the church of St. Francis in Irsina, interested by recent restoration work. Inside a tower likely dated to Norman age (12th century) was made a chapel which under the presbytery of the church decorated by a precious cycle of frescoes, painted between 1370 and 1373, from the Umbrian and Tuscan school artists, commissioned by the rich family of Del Balzo. The chapel is affected by problems of humidity which are seriously threatening the conservation of the paintings. In order to understand the cause of the moisture a one-year microclimatic monitoring has been carried out. The multitemporal observation put in evidence that moisture condensation can partially explain the phenomenon of humidity. Therefore, aerial images were taken from a drone in order to detect points of water infiltration.

The detailed 3d model also allowed to map decay patterns and the evaluate the state of conservation of the walls and the roof covering. UAVs along with the processing method of aerial images based on SfM proved to be very capable for the diagnosis and the identification building defects.

* Corresponding author: A. Pecci a.pecci@ibam.cnr.it

THE PROBLEMS OF CONSERVATION - RESTORATION OF PAINTED OUTDOOR METALLIC SCULPTURES FROM SISAK IRONWORKS SCULPTURE PARK: THE CONSERVATION - RESTORATION TREATMENT ON SCULPTURE "OBJEKT II" BY JOSIP DIMINIĆ

Peko, N.*

Sisak Municipal Museum / Gradski muzej Sisak, Sisak, Croatia

The Sisak Ironworks Sculpture Park consists of 38 metal sculptures produced by prominent artists from all over ex-Yugoslavia from 1971. to 1990., scattered through the city quarter known as "Željezara" (Ironworks), including the Industrial zone of Sisak Ironworks. In 2012 the Sculpture Park was included on the list of protected cultural heritage of Croatian Ministry of Culture. In the same year a cooperation was initiated between Striegl Gallery, Sisak Municipal Museum, Conservation department Sisak and University of Split Conservation - Restoration Department.

In 2014, during the third workshop, the first sculpture was professionally conserved. It was the sculpture by Josip Diminić, important Croatian sculptor entitled "Objekt II" ("Object II"). Sculpture represents a small room – like shape without one wall, and with an opening in the other. Sculpture is made out of painted steel plates, and the dimensions are approximately 2x2x2m. This sculpture was chosen because it presented a wide variety of problems which also occurred on other sculptures, such as corrosion, reduced stability, paint loss and degradation and deformation of steel, so certain methods could be tested for further use, but also because of it's prominent position and the possibility of very noticeable visual change which would be the result of conservation treatment. In wide cooperation between Conservation departments Sisak, University of Split Conservation - Restoration Department, Striegl Gallery, Sisak Municipal Museum, author J. Diminić, experts from the paint industry and dry ice blasting experts, and helpful advice from The Getty Institute experts, a methodology was developed.

First phase included taking samples of the paint for testing and archive, conducting necessary scientific analysis, interviewing the author and making detailed conservation documentation. During the second phase, the highly degraded paint layers were stripped using dry ice blaster, the corroded parts were mechanically treated to remove loose corrosion products and the parts that were beyond salvageable were replaced. After that, the sculpture was repainted using modern paint system (epoxy primer and polyurethane top coating) which is very resistant to outdoor conditions. In the third phase, the sculpture was remounted on the same place where it stood before treatment and presented to the public.

During this project the conservators - restorers involved in the treatment faced a number of problems connected to the modern and industrial materials used to originally produce the sculpture, but also many ethical and professional problems concerning the treatment which, compared to treatments of "classic" artwork seems very aggressive. The experiences of conservation treatment on "Objekt II" proved to be invaluable for better understanding the common problematics of most of the sculptures in Sisak Ironworks Sculpture Park, but also for the re-evaluating the common practices and principles of conservation - restoration profession when applied to modern outdoor painted metal sculptures.

*Corresponding author: N. Peko neven.peko@gmail.com

ACTIVE CONSERVATION OF CERAMIC BUILDING MATERIALS: REMOVAL OF LICHENS ON ROOF TILES BY LASER AND BIOCIDES TREATMENTS

Pena-Poza, J.[1]; Pérez-Ortega, S.[2]; Sanz, M.[3]; Oujja, M.[3]; Ascaso, C.[4]; Wierzchos, J.[4]; de los Ríos, A.[4]; Urizal, M.[5]; Cañamares, M.V.[6]; Castillejo, M.[3]; Souza-Egipsy, V.[6]; García-Heras, M.[1*]; Villegas, M.A.[1]

[1] Instituto de Historia (CCHS-CSIC), Madrid, Spain, [2] Real Jardín Botánico (CSIC), Madrid, Spain, [3] Instituto de Química Física Rocasolano (CSIC), Madrid, Spain, [4]Museo Nacional de Ciencias Naturales (CSIC), Madrid, Spain, [5] Thor Especialidades SA, Barcelona, Spain, [6] Instituto de Estructura de la Materia (CSIC), Madrid, Spain

Very recently, in monumental cities, certain conservational practices tend to use ancient/traditional roof tiles in the restoration of Heritage buildings. Numerous studies have been undertaken to remove lichens on stones. However, little has been done to date to study lichens removal from ceramic materials, despite the fact that they are commonly colonized by different lichen communities. The main goal of this contribution is making a diagnosis of alterations that lichens may cause in ceramic materials, as well as to determine the possibilities of removal by treatments based on laser irradiation and use of biocides.

Different calcareous (CaO> 5 wt.%) and non-calcareous (CaO< 5 wt.%) roof tiles with biological colonization (mainly lichens) coming from Segovia and Guadalajara provinces in the center of Spain, were considered for the assessment of laser-biocide combination effects during cleaning tests. Three species were identified: *Pyrenodesmia teicholyta*, *Calogaya decipiens*, and *Verrucaria nigrescens*, which grow in a different way regarding the distinct composition of the ceramic substrate. The tiles chemical composition and mineralogy were characterized using X-ray fluorescence (XRF), X-ray diffraction (XRD) and optical polarized petrographic microscopy respectively. Laser irradiation was carried out by applying sequences of ns laser pulses of two wavelengths (1064 and 266 nm). After laser treatment a biocide from Thor Especialidades SA was applied. The treatment consisted of ACTICIDE CL1, Advansil PMR and ACTICIDE CF. To assess the effect of the laser irradiation, and the combination with the use of biocides, several techniques were applied, including stereomicroscopy to describe morphological changes, fluorescence microscopy to observe the viability of the algae, scanning electron microscopy (SEM) at low vacuum to analyze the effects on the surface of lichens, SEM-BSE images to study the effects of treatments inside the thalli, transmission electron microscopy (TEM) to observe cytological induced alterations, and FT-Raman spectroscopy to detect possible structural and chemical changes. In the case of *V. nigrescens* the dual laser irradiation removes many areolae, while in the cases of *P. teicholyta* and *C. decipiens*, only some areas of the thalli were detached. In this case, the cortex of the thallus was partially removed, thereby exposing the photobiont. TEM observations shown some holes produced by laser irradiation in different layers of the thalli, whereas fluorescence microscopy revealed distinct decreasing vitality of alga cells within the lichen thallus treated with biocide. FT-Raman spectra corroborated the partial removal of lichens and showed the presence of calcium oxalate produced by the reaction of lichens oxalic acid with the calcium present in the tiles. The resulting data and conclusions of this study could be extrapolated to other ceramic materials such as bricks and wall or floor tiles.

Acknowledgements: Geomateriales 2 (Ref. S2013/MIT-2914, Regional Government of Madrid and EU structural funds) and IPERION-CH (Integrated Platform for the European Research Infrastructure on Cultural Heritage (Ref. H2020-INFRAIA-2014-2015 nº 654028).

* Corresponding author: M. García-Heras manuel.gheras@cchs.csic.es

DESIGN OF DIDACTIC UNITS ON HERITAGE CONSERVATION. WHAT KIND OF TEACHING HERITAGE CONSERVATION TOPICS REQUIRE?

Pena-Poza, J.[1*]; Gil, C.[2]; Conde, J.F.[1]; Agua, F.[1]; García-Heras, M.[1]; Villegas, M.A.[1]

[1] Instituto de Historia (CCHS-CSIC), Madrid, Spain, [2] Facultad de Educación, Campus María Zambrano, Universidad de Valladolid, Segovia, Spain

The subject of teaching Historic and Cultural Heritage in primary and secondary schools is not a novel topic and has been widely covered in the last few years. However, the specific topic on Heritage conservation, either in the curative or in the preventive side, has been barely developed despite its transcendence from the point of view of future preservation of Heritage items.

This contribution presents the theoretical and practical background in which the design of a didactic unit on Heritage conservation has been based. The unit is aimed at primary, secondary and high school students, and basically consists of two differentiated materials: a didactic program with concepts and ideas to be developed in the unit and a teaching guide for helping teachers with varied tools to address the didactic unit.

Among the main objectives which are intended to be covered by such a didactic unit are the significance and importance of the Cultural Heritage, the importance of its conservation, the recognition of Heritage locales, when is important to conserve them, differences between conservation and restoration, the influence of environmental conditions and so on.

Together with the educational program and the teaching guide, both designed to be developed in the classroom, the unit is complemented with a visit to a Heritage place (a building or a museum for example), with the aim that the concepts learned inside the classroom are reinforced outside in a real Heritage site.

Possible evaluation activities and suitable schools in which the unit could be put into practice are also some of the subjects dealt with in this contribution.

Acknowledgements: Geomateriales 2 (Ref. S2013/MIT-2914, Regional Government of Madrid and EU structural funds) and MINECO project (Ref. MAT2015-65445-C2-2-R, Spanish Ministry of Economy and Competitiveness).

* Corresponding author: J. Pena-Poza javier.pena@cchs.csic.es

UNLOCKING THE SECRETS OF MANUSCRIPT ILLUMINATION. NON-INVASIVE INVESTIGATION OF PAINTING MATERIALS AND TECHNIQUES

Pereira-Pardo, L.*; **Ricciardi, P.**

Department of Manuscripts and Printed Books, The Fitzwilliam Museum, University of Cambridge, Cambridge, United Kingdom

Illuminations from more than one hundred manuscripts and manuscript fragments from the Fitzwilliam Museum have been analysed in the framework of the cross-disciplinary project MINIARE (www.miniare.org). The main objectives were to develop a comprehensive protocol for the non-invasive analysis of artists' materials and techniques, to examine large and representative groups of illuminated manuscripts (from across Europe, along with some Asian examples, ranging from the tenth to the sixteenth centuries) and to interpret the scientific results in order to shed light on questions concerning technical art history and conservation.

The analytical protocol consisted in a combination of non-invasive techniques: infrared imaging, optical microscopy, UV-Vis-NIR-SWIR fibre-optic reflectance spectroscopy (FORS), X-ray Fluorescence (XRF), external reflectance FTIR and Raman spectroscopy. This approach proved to be successful for the characterisation of fragile materials such as medieval illuminated manuscripts and could also be transferable to the investigation of other types of painted artefacts, even as a preliminary stage to the micro-invasive analysis of multi-layered objects, such as polychrome sculptures.

Different research questions were addressed for each manuscript, based on the discussion between the scientists, curators and conservators: Is under-drawing present? What is the pigment palette? And the pictorial technique? Were the artists using unusual pigments or binders? May trends in the use of certain painting materials be detected during the period studied? Are they related to a particular country or workshop? How many hands participated in the illumination of the manuscript? Were there influences across different painting media (i.e. panel painting, wall paintings…)? What techniques were used for metal tooling? How were the draperies and flesh tones modeled? Can technical analysis help in the attribution of authorship? Can it help understand how pigments were manufactured? How and why have certain pigments degraded over time? Were the illustrations retouched? If so, when did the intervention happen? The answers to these questions will be illustrated with representative examples of the results obtained within the research project.

* Corresponding author: L. Pereira-Pardo luciapereirapardo@gmail.com

MICROEMULSIONS FOR CLEANING HYDROPHOBIC MATERIAL FROM SPANISH WALL PAINTINGS

Pérez Benito, P.*; Regidor Ros. J.L.; Roig Picazo, M.P.

Instituto Universitario de Restauración del Patrimonio (IRP-UPV), Valencia, Spain

The application in mural painting of protective layers in successive restorations was a regular treatment in the past. Products as waxes or synthetic polymers were employed. The traditional cleaning techniques often used are based on mechanical methods or by employing organic solvents. These treatments are toxic, aggressive with mural painting, not completely effective and generate other problems as a result of the porous nature of the material. For this reason, a suitable alternative are considered the smart nanostructured systems such as microemulsions or micellar solutions for cleaning this type of material.

The first application of microemulsions for the conservation of cultural heritage was performed by E. Ferroni and P. Baglioni at the end of the ’80s, during the restoration of the the Brancacci Chapel in Florence (Zorzi, 1992). The use of a microemulsion was for the removal of wax. These have subsequently been primarily used to remove synthetic polymers applied in previous restorations (Carreti, 2007). Following the publication of some successful interventions in Italy, different microemulsions were tested in two very specific casuistical of Valencian paintings (Ducal Palace of Gandia and the Church of St. Nicholas in Valencia). In both cases, advantages and disadvantages were detected using these cleaning systems which serve for the carrying out of this research. In the Ducal Palace of Gandia was tested the micellar solution of propylene carbonate and 1-pentanol to remove synthetic polymers. Analytical studies made after, detected significant amounts of sodium attributable to the presence of surfactant. However, in the Church of St. Nicholas we found layers of wax, paraffin, fatty acids with dirty and salts. After the application of a microemulsion of xylene and ammonium carbonate, a reduction of existing salts was observed, but this did not take place with the fatty material.

The problems that emerged during the restorative practice like surfactant residues, high contact times in paintings with gypsum plaster inside, and the evaluation of the cleaning results, serve for the development of this investigation.

Carretti, E. et. al. 2007. Oil-in-Water Nanocontainers as Low Environmental Impact Cleaning Toolsfor Works of Art: Two Case Studies, Department of Chemistry and CSGI. Langmuir, 23 (11),S 6396–6403

Zorzi, R. et. al. 1992. La Cappella Brancacci. La scienza per Masaccio, Masolino e Filippino Lippi. Olivetti, Milano.

* Corresponding author: P. Pérez Benito paupebe@bbaa.upv.es

EVALUATION OF CHANGES IN HYDRIC PROPERTIES OF STONE MATERIAL AFTER RESTORATION TREATMENTS THROUGH THE USE OF IR THERMOGRAPHY

Pérez-Ema, N.*; Alvarez de Buergo, M.; Gomez-Heras, M.

Geosciences Institute IGEO (CSIC, UCM), Madrid, Spain

This study analyses the effects arising from the application of different conservation treatments, consolidating -Estel©1000(S) - and water-repellent products - Tegosivin©(H) and UCAT-10P©(N)-, on marble and granite material from the Roman theatre in Merida (Spain), listed as UNESCO World Heritage Site. Different portable and non-destructive techniques have been used in order to assess changes in the behavior of treated and non-treated samples (ST).

IR thermography enabled monitoring the response of the samples through capillary rise, water-desorption and cooling tests. The comparative analysis between treated and non-treated samples was performed by calculating the $\Delta^{o}C/h$ value (Figures 1 and 2). Capillary rise test clearly showed a different response of the samples treated with water-repellent treatments (H, SH and N), which showed just a slight drop of apparent surface temperature, which is interpreted as the result of a lower amount of water entering inside the porous system. However, Estel©1000 treated samples (S) showed a large and rapid drop in apparent surface temperature; even to below the levels of untreated samples (ST), indicating that water access occurs faster. This may be due to the transformation of the porous system and the increase of micro-porosity as a result of partial filling of larger pores.

Results from desorption test also show this difference. Samples were immersed in water for 24 hours before testing. Samples with water-repellent treatments, containing only superficial water, increased apparent surface temperature immediately. However, the samples in which the water penetrated first, cooled down and after increased its temperature. Samples with Estel©1000, again, show a greater difference with respect to untreated samples, taking longer to recover apparent temperature, because the water is retained inside for longer. Finally, the cooling tests, preceded by heating of the samples in an oven at 40 °C for 24h, shows little variation between treated and untreated samples, reaching room temperature in approximately 1h.

Figure 1. Capillarity curves of granite samples

Figure 2. Capillarity curves of marble samples

* Corresponding author: N. Perez-Ema nataliaperezema@hotmail.com

TECHNIQUES OF CHARACTERIZATION USED IN CONSERVATION APPLIED TO CIVIL ENGINEERING PURPOSES

Pérez Fortes, A.P.[1*]; Varas Muriel, M.J.[1, 2]; Castiñeiras, P.[1]

[1] Dept. Petrology and Geochemistry, Faculty of Geological Sciences, Complutense University (UCM), Madrid, Spain, [2] Geosciences Institute IGEO (CSIC, UCM), Madrid, Spain

The use of environmental friendly materials and infrastructures in civil engineering is more and more demanded nowadays. Technicians and builders need to find efficient and durable materials and, thus, methods to evaluate the quality and durability of building materials are getting more attention.

The properties of the materials used in civil engineering and the requirements for their quality and durability are well established in current standards. However, some of the specified tests and methods make difficult the evaluation of these materials' properties either in the field or when they are already in use. For these reasons, it is important to find non-destructive and portable techniques which can complement to current standards in order to evaluate the quality of the materials used in civil engineering.

With this purpose, two portable techniques used to characterize materials in heritage conservation, optical roughness tester and micro-drilling, were applied to evaluate the quality of aggregates and asphalt mixtures respectively used on Spanish roads. The data collected were compared with the standard tests, Polished Test Value (PSV) and Los Angeles Test (LA), commonly applied to road aggregates. Both techniques offered adequate results to estimate the quality of the road aggregates. The aggregates with higher surface roughness showed a better resistance to be polished. Thus, optical roughness tester could be used in the future to predict the resistance to be polished of crushed rock aggregates. In addition, the components of the asphalt mixtures analyzed could be classified by their resistance to be drilled by micro-drilling technique. Therefore, this technique can help to detect the use of bad quality materials inside the mixture not only in the laboratory, also on roads.

Research funded by Geomaterials 2 (S2013/MIT_2914) Programme.

* Corresponding author: A.P. Pérez Fortes appfortes@gmail.com

THE HYDRATION OF LIME USING NOPAL MUCILAGE TO OPTIMIZE HYDRATED LIME MORTARS FOR CONSERVATION OF BUILT HERITAGE

Pérez, A.[1*]; Guerrero, L.[2]; González J.L.[3]; Prado, R.[1]

[1] Architecture Faculty, Universidad Nacional Autónoma de México (UNAM), México City, Mexico, [2] Architecture Faculty, Universidad Autónoma Metropolitana (UAM), Mexico City, Mexico, [3] Chemistry Faculty, Universidad Nacional Autónoma de México (UNAM), México City, Mexico

This investigation main objective is to improve mechanical and rheological properties of lime mortars used in conservation tasks of built heritage, by using the nopal mucilage solution at a suitable concentration for hydration of quicklime. If this goal is achieved, a second aim could be reached: a reduction in aging period of time for hydrated lime putty. A specific objective includes the study of mucilage and lime chemical interaction.

Advances in the investigation includes literature review about hydrated lime behavior, chemical and physical lime properties, lime mortars requirements proposed by some institutions like ICCROM and by authors' experiences as executors

An experimental phase was performed where different nopal mucilage extraction methods were tested being possible to classify them in two groups: the ones that need water to get the mucilage and the ones that obtain the mucilage directly from the plant without any other substance. The methods from the first group are based on cutting nopal into small pieces and soaked them in water (1:2 nopal pieces: water) for about 24 hours and at the end of this period of time, a viscous liquid is obtained and considered as a 100% nopal mucilage solution, although it has not been determined the real amount of water and nopal mucilage in the solution. This method was developed using as experimental variables temperature and agitation rates. In the second group of extraction methods a process was developed consisting of scrapping mucilage off the nopal parenchyma in which there is a great amount of a fluid with higher viscosity than that obtained from the first group. This fluid is considered mucilage in a 100% concentration and as in the first group, different temperature and agitation rates were tested. The nopal species used in this experimental phase were some indigenous to Tetla Tlaxcala and some to Tlaxcalancingo Puebla, they were 2 years old and were cut from the second ramification of the plant. Furthermore, as part of a chemical hypothesis that proposes an acid substance found in nopal mucilage as the responsible for the strong interaction between lime and mucilage, acid base titrations were developed on the products obtained from both groups of extraction methods and it was concluded that temperature and agitation rates affect the composition of nopal mucilage and that the best behavior was developed by the 2nd extraction method group.

A lime hydration (CaO: mucilage) experiment was performed with different concentrations of mucilage solutions (mucilage-water) 20%, 60% and 100% from both groups of extraction methods and different behaviors were observed during different hydration stages. It can be concluded that the 2nd method is not useful to produce lime putty.

* Corresponding author: A. Pérez restauracultura@gmail.com

BUILT HERITAGE MATERIALS AS DOCUMENTAL RESOURCE

Perez-Monserrat, E.M.[1*]; Fort, R.[1]; Varas M.J.[1,2]; Alvarez de Buergo, M.[1,3]

[1] Geosciences Institute IGEO (CSIC-UCM), Madrid, Spain, [2] Faculty of Geological Sciences, Complutense University of Madrid (UCM), Madrid, Spain, [3] YOCOCU Youth in Conservation of Cultural Heritage, Spain

Building materials that shape ancient constructions entail an important heritage value itself. The aim of the work focuses on showing how these materials provide information about the thought of the architect, the ideology of the project and the grounds that determined materials selection. If the interventions carried out, that have preserved or not the message the architect intended to convey, are also taken into account, its study provides a valuable document and supposes a commitment with its conservation.

The Former Workers Hospital of Maudes, Madrid (1909-1916) [Antiguo Hospital de Jornaleros de Maudes], built by Antonio Palacios (1874-1945), has been chosen. The brickwork walls comprise outer face stonework shaped mainly with limestone, decorated with ceramics and grouted originally with a thick joint mortar; in some areas, artificial stone and coatings are used. The property has undergone two major interventions (1984-1986 and 2006-2008) and since 1986 it houses various administrative offices of the Community of Madrid (Spain).

The light hue limestone entailed an aesthetically pleasing building material that takes part in the homely atmosphere that Palacios wanted to provide to the hospital. Moreover, it was a stone economically very competitive because of its relatively easy extraction and transport by rail directly from the quarry. Ceramics, conceived to provide light and movement to façades, include panels and mosaic tiles or *trencadiç*. Palacios wanted to enrich stone façades texture by applying thick joint mortars; he conceived the use of artificial stone at top construction elements as modernity distinctive and he covered the brickwork in some areas with stone imitation coatings as a precautionary measure to set *a priori* the economy of the construction.

The interventions accomplished have overall kept the message that Palacios provided to the property through the building materials used, although some materials must be replaced due to its high degree of decay. Limestone is entirely original and it has been cleaned twice by bead blasting particles. Regarding ceramics, in 1984-1986 the original panels were replaced almost entirely and most of the current mosaic tile was placed; in 2006-2008 their colors were recovered by cleaning and joint pieces were reintegrated. Artificial stone and coatings were cleaned or replaced in the 80s and new artificial stone was made to replace some elements; in 2006-2008, these materials were cleaned and painted again and the joint mortars were replaced almost entirely.

Research funded by Geomaterials 2 (S2013/MIT_2914) Programme.

Perez-Monserrat, E.M.; Varas, M.J.; Fort, R.; Alvarez de Buergo, M. 2011. Assessment of different methods for cleaning the limestone façades of the Former Workers Hospital of Madrid, Spain. Studies in Conservation 56, 298-313.

*Corresponding author: E.M. Pérez-Monserrat empmon@geo.ucm.es

REPRODUCED VS ORIGINAL GLASS FROM THE COLLECTION OF KING FERDINAND II

Pessoa e Costa, M.[1*]; Ruivo, A.[2]; Cerqueira, L.[3]; Vilarigues, M.[4]

[1] Department of Conservation and Restoration, FCT NOVA, Portugal, [2] LAQV, REQUIMTE, FCT NOVA, Portugal, [3] C2TN, IST/CTN, University of Lisbon, Portugal
[4]Research Unit VICARTE – Glass and Ceramics for the Arts, Portugal

Throughout time glass has been suffering adjustments on its composition and on the technology of production. These changes have a profound impact on the thermal and chemical properties. The production of samples based on the composition of historical glasses is a powerful tool for a better understanding of the impact of the composition on degradation mechanisms of historical glasses.

For this work, glass samples with three different compositions, based on the chemical characterization of three stained glass panels from the collection of King Ferdinand II, in exhibition in the National Palace of Pena (Sintra, Portugal) were produced. The stained glass panels are dated from three different periods, 14th, 16th and 19th centuries. The panels from the 14th and 16th centuries are attributed to German production, while 19th century panel was probably produced in the Low Countries.

Original and reproduced glasses were characterised by Particle Induced X-ray Emission (PIXE) and Energy Dispersive X-ray fluorescence spectroscopy (EDXRF) in order to compare their composition. The reproduced samples presented higher contents of alumina (Al_2O_3), silica (SiO_2), iron oxide (Fe_2O_3) and sodium oxide (Na_2O). This alteration may be related to the crucible composition and with the interaction between the crucible elements and the glasses that are being produced. At high temperatures a contamination of the synthesized glasses by the crucible can occur. The concentration of other oxides, such as potash oxide (K_2O), calcium oxide (CaO) and magnesium oxide (MgO), decrease slightly during the glass synthesis.

This project shows that more investigation on the reactions occurring during the melting is necessary. It is important to determine which elements are lost during the glass production in order to attain a better control of the final composition of the reproduced glasses.

* Corresponding author: M. Pessoa e Costa ml.costa@campus.fct.unl.pt

THE FORNELLO PROJECT. REEVALUATING THE IMPORTANCE OF CONSERVING AN ICONIC RUPESTRAL CHURCH IN THE PUGLIA REGION, ITALY

Petcu, F.A.*

YOCOCU ROMANIA, West University of Timişoara, Faculty of Arts and Design, Conservation & Restoration Dept., Timişoara, Romania

The present article is meant to redefine the importance of conserving a particular example of a neglected rupestral settlement situated in an ancient rural landscape of the Puglia region. Located in Southern Italy, in the province of Bari, the area bears a dense value of multicultural content in terms of material heritage. The crucial historical significance of the area, from prehistoric to ancient and medieval times and further on, describes the region as a place of dynamic intercultural confluences, a cultural crossroad through several millennia.

The emphasis on the present monument follows as a consequence of various characteristics which draw its particular valuable character as a highlight of world heritage. The geographical setting, the geomorphic features, the archetype of *The Cave,* its surroundings and the ensemble, the initial setting of the natural cave as also various further adaptions of the existing volumes of space support the growth of the concept of this cave as Liturgical space, in the first place. Second, we want to point out some relevant information on the sepulchral function of the cave, the artistic value of the Byzantine style frescoes and the confluences of epigraphic evidence, evoking donors and a unique spatial syntax described by the iconography of the frescoes related to the Liturgical function of sacred space. A third argument is made by the superimposition of several layers of painted plaster, the degradation phenomena on the material structure of the pictorial layers and the global conservation issues which describe the ensemble, together with all the following consequences and professional implications for a future restoration. All these arguments point out a rational sequence of reasons to highlight the spectacular importance of this site.

The described church was briefly mentioned in the literature that documented cave churches, but has never, until now, become the subject of an accurate research in iconography and spatial syntax, following a study of conservation. Our contribution in the last years, starting 2014 and working together with Messors Inc. on the preliminary interventions towards the rehabilitation of the site, have spotted new lights on deciphering the layers, the iconography and the spatial syntax of the space and have opened windows towards mining necessary resources for a future conservation of the site and its rehabilitation to a sustainable potential as a valuable cultural investment. A documentary film has been shot last year on behalf of the present project, with founding from the Canadian Arts Council.

Figure 1 shows an image of a 3D Scanning of the main cave church (2015).

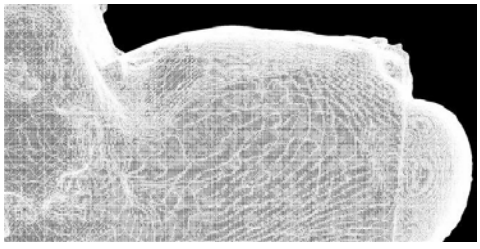


Figure 1. The main cave Church, detail (of a 3D Scanning (2015)

*Corresponding author: P. Filip Adrian filip.arte@gmail.com

THE MAIN STREET APPROACH IN THE USA. HINTS FOR A SUSTAINABLE TOURISM IN SARDINIAN HISTORIC DOWNTOWNS

Pinna, A.*

Università degli Studi di Cagliari, Italy

The Main Street Approach in the USA has been, and still it is, a successful way for the enhancement of city downtowns, with over 2000 historic downtown revitalizations over the past 35 years – since 1977. Such downtown development strategy is grounded in a four-point programme – organization, promotion, design, and economic restructuring – which were thought for small cities at the beginning, but due to the positive outcomes, it has become largely used in other environments, such as big town districts, urban areas, etc.

Even though its widespread use in the USA, in Europe scholars had conducted little research on this topic; indeed, one has many difficulties in finding papers or publications on the Main Street Programme question. At the same time, in relation to the concepts of authenticity, sustainability, *genius loci*, the analysis of the architectural results acquired from the Main Street Programme is of particular concern, due to the fact that these concepts are differently considered in American experiences of historic conservation.

So the first aim of the survey is to analyse the state of the art on the Main Street Approach in Europe, and to present some American case studies, making a comparison with strategies and results in the Sardinian context.

In conclusion, the upshot of this survey should lead to planning proposals for the revitalization of Sardinian downtowns, especially promoting both historic conservation and tourism activities. The aim is to develop sustainable tourism models to foster the existing business, models which could make cost-effective the conservation and the enhancement of Sardinian historic downtowns, respecting authenticity and *genius loci* concepts.

Brink, P. 1998. Heritage Tourism in the U.S.A.: Grassroots Efforts to Combine Preservation and Tourism. APT Bulletin 29-3: 59-63.

Dokmeci, V.; Altunbas, U.; Yazgi, B. 2007. Revitalisation of the Main Street of a Distinguished Old Neighbourhood in Istanbul. European Planning Studies 15-1: 153-166.

Fiorani, D. 2013. The other shore. Preservation and the past in the United States. Loggia 26: 8-37.

Longstreth, R. 1999. Architectural History and the Practice of Historic Preservation in the United States. Journal of the Society of Architectural Historians, 58-3: 326-333.

Robertson, K. 1999. Can small-city downtown remain viable? A national study of development issues and strategies. Journal of the American Planning Association 65(3): 270-283.

Robertson, K. 2004. The main street approach to downtown development: An examination of the four-point program. Journal of the Architectural and Planning Research 21, Spring: 55-73.

* Corresponding author: Andrea Pinna pinnandrea16@gmail.com

SALT WEATHERING AND HYGRIC EXPANSION OF TUFF ROCKS IN ARCHEOLOGICAL SITES IN CENTRAL MEXICO

Pötzl, C.[1*]; López-Doncel, R.[2]; Wedekind, W.[1]; Siegesmund, S.[1]

[1] Geoscience Center of the Georg-August University (GZG), Göttingen, Germany,
[2] Geological Institute of the autonomous University of San Luis Potosí (UASLP), Mexico

The pyramids of Plazuelas are located in the southwest region of the state of Guanajuato in Central Mexico. They represent a prehistorical temple complex build at 450 AD by the Chichimecas, a sophisticated predecessor culture of the Aztecs. After it was abandoned at approximately 900 ADthe [illegible] for several centuries and excavated in 1998.

The building stones used for the construction are mainly volcanic tuffs from the immediate vicinity. They show damages and weathering characteristics according to the weathering processes they experienced for over thousand years. To enable protection of the cultural assets against further damage, we have to understand the damaging mechanisms and their interactions among themselves.

Seven different building stones were analyzed in terms of their pore space properties, water transport and retention properties, as well as their mechanical properties and weathering characteristics. Mineralogical composition and whole rock petrochemistry were analysed by optical microscopy, XRD and XRF. In a field survey structural damages and intensities were mapped in situ at every side of the main pyramid.

The field survey shows substantial types of damage of the used tuffs. Crystallization processes of salt in the pore space as well as hygric expansion due to changes in the moisture content are considered as essential damaging factors. They are highly influenced by the pore space properties, which turned out to be the regulating parameters in the rocks considering the weathering behavior and resistance.

Salt weathering experiments show different types of behavior of the rocks to salt loading. It exist a distinct correlation to the hygric expansion and the content of micropores. We could show that under the present climatic conditions a bimodal pore radii distribution with a high amount of micropores has proven inappropriate for the building stones.

For the weathering behavior of the rocks we attach great importance to the environmental conditions, especially the exposition of the building stones in the monument, the temperature and the moisture availability. Under the present environmental conditions conservation measures are challenged to reduce the salt contamination while facing a high risk of hygric expansion in the building stones.

* Corresponding author: C. Pötzl christopher.poetzl@gmx.de

ANALYSE TO ASSESS: ARCHITECTURAL CHARACTERISTICS OF THE TRADITIONAL HOUSING IN THE CASBAH REGION OF ARGIERS, ALGERIA

Prieto Sanz, S.*

Architectural University of Madrid (ETSAM-UPM), Madrid, Spain

The purpose of this paper is to understand and emphasize the architectural characteristics of the traditional houses of the Casbah region, in Argiers. The historical centre was formed by the succession of different civilisations over time. Currently, an Ottoman residential typology of great historical and artistic value is at high risk of being dissolved.

It is in a transitional period between the current poverty of the area and its state of degradation, and the urban regeneration planned for the future. For this reason, it is necessary to study the distinctive elements of this architecture in order to value and preserve them during possible transformations in the city or creation of modern housing in the future.

Firstly, I carried out a study of the conservation and development plan of the Casbah area and others works including plans about the architecture and drawings of the area, using them to elaborate graphic documents to explain it and to try to recreate the houses.

The analysis focuses on evaluating the main components of the house, its structure, limits, and different uses; such as shops, workshops and its habitability. I've identified the most important aspects about the walls, patio and gallery, upstairs terraces, access to the house, wells and cisterns, and the stability precautions in case of earthquakes. In addition, it is necessary to pay attention to these elements from an urban point of view as a whole.

In conclusion, this paper shows the need to preserve and remind people of the importance and value that the characteristics of this architecture possess, in order to keep and enjoy the traditional Algerian housing.

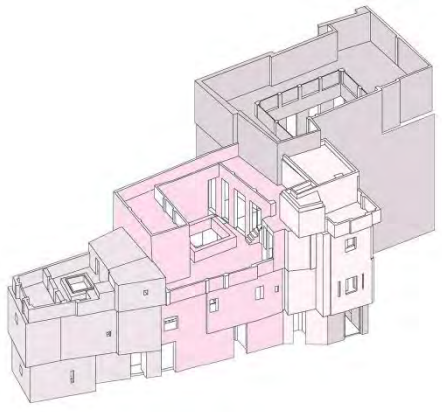


Figure 1. Axonometric of the study sample

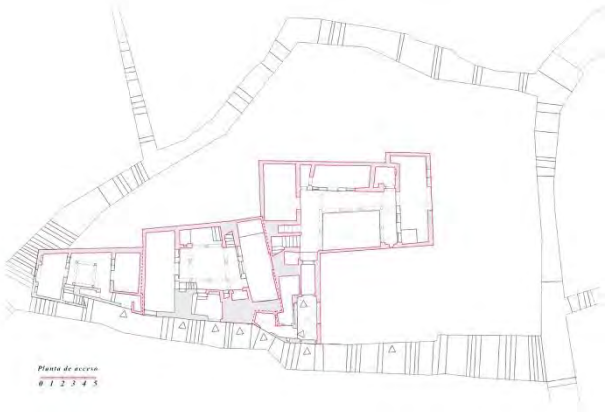


Figure 2.Plan of the study sample, four adjacent houses in the Casbah

*Corresponding author: S. Prieto Sanz soniaprietosanz@hotmail.com

ANALYSIS OF THE CRITERIA OF CHOICE OF THE VARIABLES DETERMINANTS OF ECONOMIC INDEX OF THE VALUE OF THE HISTORIC CENTER OF CARTAGENA (SPAIN)

Pujol Galindo, M.D.[1*]; Ramírez Pacheco, G.[2]; Aragonés Beltrán, P.[3]

[1] Superior Technical School of Architecture and Building, Technical University of Cartagena (UPCT), Cartagena, Spain, [2] Superior Technical School of Architecture, Technical University of Madrid (UPM), Madrid, Spain, [3] Department of Engineering Projects, Technical University of Valencia (UPV), Valencia, Spain

This communication is part of a line of research whose main purpose is to obtain an economic index that disclosing the monetary value of the historic center of Cartagena (Spain).

This heritage asset has a certain degree of complexity. Therefore establishing four environments which describe it and characterize: physical, social, economic, and institutional. In turn, each environment is hierarchically defined by areas and fields. The last level, sets a series of variables relating to each area.

The design of this model is based on the techniques of decision Multicriteria applying to its definition the valuation method analytical Multicriteria (AMUVAN). This method was applied for the first time in 2011 by J. Aznar, V. Estruch and P. Aragones, using the combination of the application of the analytic process in network (ANP) developed by Thomas Saaty in the 1990s and the traditional income update.

The views of experts on those aspects that condition or define the good object of analysis is required for ANP. Ninety-nine variables that could influence the enhancement of this well were established in the model designed for the determination of the economic index of the value of the historic center of Cartagena.

In the next phase surveys were raised to experts who gave their opinion about the variables that were determinants of the value of the historic center of Cartagena and which not. To do this they interviewed several experts from the private sector of the city and others of the institutional sector, both of the physical environment (architects, urbanists), social (experts in human geography), economic (economists and trade associations) and institutional (local administration).

This paper discusses the interviews and survey results raised in this first phase, carried out an analysis comparative results between experts from the private sector and the institutional and assessing the impact on the final model of the profile of each type of expert. The aim of the communication is to establish how each expert's profile can influence the definition of the model.

* Corresponding author: MD. Pujol Galindo md.pujol@upct.es

DISCOVERY AND RESTORATION OF A MURAL PAINTING IN THE HERMITAGE OF SAN ANTONIO ABAD IN VILLAHERMOSA DEL RÍO (CASTELLÓN, SPAIN)

Pujol, P.[1*]; Sanz, A.[1]; Miraflores, E.[1]; Mercé, P.[2]

[1] Restoration Service in Diputación Provincial, Castellón, Spain, [2] Freelance Art Photographer, Spain

Villahermosa del Río is the small town in Castellon where the thirteenth century hermitage of San Antonio Abad is located. It houses the recent discovery of a tempera painting wall panel of the last third of the fifteenth century. During its architectural restoration, due to suspected remains of oldest painting, it was decided to conduct a series of studies to verify the existence or not of underlying paintings. There was not any information about them, because all the files disappeared in the Civil War, although we find some references in 1526 which describe the existence of the chapel and, in the twentieth century, a monograph refers to a repaint covering older wall paintings.

Before and during the restoration process of the wall panel located opposite the main entrance, studies have been conducted by taking micro-samples, subsequent laboratory analysis and the use of special photography techniques. Image processing also provided very useful information for the detection of hidden paintings under the repaint.

After exhaustive documentation, the panel restoration was performed in several phases: the first cleaning tests uncovered the bottom part of the central figure and, as the processes continued, it became possible to see a scene with three saints: Saint Christopher, Saint Sebastian and a figure still unidentified. These last two figures were covered by an eighteenth century thick layer of mortar used to decorate a former central altarpiece, now disappeared. Since this altarpiece no longer existed in the nineteenth century, the entire panel was covered with a blue layer.

The process of conservation and restoration began with the removal of this layer of blue paint with the help of pretesting that allowed working on a part by part basis. After a studied and punctual paint layer consolidation, essays to identify the most appropriate combination of mortar according to the hermitage environmental conditions were carried out. The pictorial reintegration, supported by visible light photographs, will be carried out with minimum intervention, being respectful of the original.

* Corresponding author: P. Pujol pilarp@dipcas.es

SPECIAL PHOTOGRAPHY TECHNIQUES APPLIED TO A TEMPERA WALL PAINTING IN THE HERMITAGE OF SAN ANTONIO ABAD IN VILLAHERMOSA DEL RÍO, CASTELLÓN, SPAIN

Pujol, P.[1*]; Sanz, A.[1]; Miraflores, E.[1]; Mercé, P.[2]

[1] Restoration Service in Diputación Provincial, Castellón, Spain, [2] Freelance Art Photographer, Spain

Villahermosa del Río is the small town in Castellón where the hermitage of San Antonio Abad is located. It houses the recent discovery of a tempera wall painting of the last third of the fifteenth century. During its architectural restoration, due to suspected remains of oldest painting, but with no information about them in the files, it was decided to conduct a series of studies to verify the existence or not of underlying paintings.

The results of the techniques used confirmed its presence and, after exhaustive documentation, the restoration of the panel located opposite the main entrance was performed. The first cleaning tests uncovered the bottom part of the central figure and, as the processes continued, it became possible to see a scene with three saints: Saint Christopher, Saint Sebastian and a figure still unidentified.

Before and during the restoration process, studies have been conducted by taking micro-samples, subsequent laboratory analysis and the use of special photography techniques such as ultraviolet fluorescence, infrared photography (with several wavelengths) and visible light (macro photography, fluorescence...), in addition to image processing that has provided very useful information for the detection of hidden paintings under the repaint.

These photographs have provided information regarding, among others, the state of the support, characteristics in the technique of execution, traces of paint in areas with layer losses, types of pigments and dyes used, or possible repainting. In addition, photographs, taken with an outline of areas, have allowed to keep record of the different processes in the panel conservation and restoration (initial state, alterations, cleaning, stucco application) and will be a valuable aid in the process of pictorial reintegration.

* Corresponding author: P. Pujol pilarp@dipcas.es

THE USE OF WATERCOLORS SELF-PRODUCTION IN AQUAZOL APPLIED TO CONSERVATION OF ART ON PAPER

Puteo, S.*

Istituto Centrale per il Restauro e la Conservazione del Patrimonio Archivistico e Librario, Rome, Italy

During the research of my dissertation in Istituto Centrale per il Restauro e la Conservazione del Patrimonio Archivistico e Librario in Rome (Puteo 2016), I decided to study the resin Aquazol®, (Poly-2-Ethyl-2-Oxazoline or PEOX) widely used in the restoration of paintings (Bestetti and Saccani 2014; Bestetti et al 2014), applied in the restoration on art work on paper and, in particular, toning the superficial abrasions both the loss compensation of the lacunae. It is an experimental project designed to compare the applicability of these new watercolors with the industrial watercolors, also for the possibility to dissolve the resin in ethanol, a organic solvent, which prevent the contact of the water with artwork feeling to humidity. Positive results would allow its use in the retouching of losses in alternative to the traditional watercolors.

Six palettes are prepared, each of five mineral pigments, chosen from among those accepted for the chromatic reintegration and for the same Colour Index (Raw Sienna, Venetian red, Chrome Oxide Green, Ultramarine blue, Ivory Black-Kremer) tied with Aquazol 50, 200, 500, dissolved in water and in ethanol. The scientific experimentation describes the comparison among the five colors and the same available commercially (Winsor & Newton, Schmincke and Kremer). The tests are prepared by applying all watercolors on samples of paper "Whatman 1", selected for its requirements and for its ability to simulate the behaviour of the paper. The samples are observed for the characterization of the initial values and then to accelerated aging (UV light and then to temperature and relative humidity controlled).

The samples are subjected to diagnostic analysis, such as colorimetric measures, surface pH and opacity. Different behaviours are detected in Aquazol in relation to their different molecular weights and to solvents in which they are dissolved. The aging of paper "Whatman 1" not treated with Aquazol presents a global change compared to the initial parameters, while the papers treated with Aquazol 50, 200, 500 both in water and in ethanol exhibit more variations. The initial values of pH, near neutral, become slightly acid. The opacity of all samples increases. The samples show that the values of the watercolors Winsor & Newton, Schmincke and Kremer remain colorimetric stable after accelerated aging, while the watercolors in Aquazol show more changes. In conclusion it will be necessary to continue with further tests to confirm the validity of the watercolors of Aquazol applied to the reintegration of the artworks on paper.

Bestetti, R., Colombo, A., De Luca, D., Selva Bonino, V., Ubaldi, V. 2014. Aquazol based retouching colors Preliminary Tests and Advancement of an Experiment, POSTER at RECH 2 International Meeting on Retouching of Cultural Heritage, Porto, Portugal 24-25 October 2014.

Bestetti, R., Saccani, I. 2014. Material and Methods for retouching colors self production, RECH 2, International Meeting on Retouching of Cultural Heritage, Porto, Portugal 24-25 October 2014.

Puteo, S. 2016. The treatment of the lacunae in the artworks on paper: the conservation work on the drawings of Renato Guttuso, dissertation in Istituto Centrale per il Restauro e la Conservazione del Patrimonio Archivistico e Librario (A.Y. 2014-2015), e-book in publishing.

* Corresponding author: S. Puteo silviaputeo@virgilio.it

THE FRANCISCAN PORTRAIT OF THE XVIIIth CENTURY

Quispe Bejar, J.L.*

Museum and Catacombs of San Francisco, Lima, Peru

The Franciscan Province of the Twelve Apostles of Peru has an important collection of paintings in the museum and catacombs of San Francisco of Lima, pieces of great artistic and historical value. These include works made by well-known authors in their time, whose fame transcends even our days. Among them are notable examples: paintings from the workshops of Peter Paul Rubens, Francisco de Zurbarán, as well as local painters from different periods. Special attention should be paid to paintings of the lives of San Francisco displayed in the main cloister of the convent, and also paintings that were commissioned by the franciscan friars of their Provincial Superiors and notable friars, popes, bishops, writers, theologians, etc. These last ones painted in the eighteenth century.

Given these topics and the relevance of easel painting in the museum: it has been intervening these goods in order of priority and according to the condition in which they are, so that in recent years has been restored sequences and portraits of famous writers and Franciscan theologians who were in the depository, for this purpose, cataloging and multidisciplinary work he has defined actions to safeguard the heritage of the Franciscan convent and its formidable collection.

In this case are provided intervene pictures from the same source (depository): Luis Gerónimo de Oré, Gonzalo Tenorio (figure 1), Gerónimo Valera, San Buenaventura de Salinas, Juan Capistrano and Clement XIV series of popes located in the Clementine Hall, first level among others; the latter two are currently on display pieces. And pieces of the collection and recovered during conservation work in linen, with the team cataloging.

The whole intervention process is carried out in the studio of easel painting museum facilities, with all the means available to the institution. This is a job that is part of a preservation policy and the challenge assumes solvency ecclesiastical administration over its assets, putting it at the vanguard of the preservation, research and diffusion of its exceptional cultural heritage.

Figure 1. Cleaning process, portrait of Gonzalo Tenorio

*Corresponding author: J.L. Quispe Bejar josqb@hotmail.com

PARTNERSHIPS AS STRATEGIES OF CULTURAL POLICY FOR SUSTAINABLE DEVELOPMENT OF CULTURAL HERITAGE

Radović, K.*

Centre for Interdisciplinary Studies, University of Arts, Belgrade, Serbia

Instrument of public-private partnerships (PPP) has been in use, as an interdisciplinary approach to conservation and revitalization of immovable cultural heritage, since the late 1960s, mainly in the area of urban regeneration. Soon, the use of PPPs expanded to conservation and management of archaeological sites, buildings, landscapes, collections etc. It became a widespread mean of financing these types of projects, in many countries of the world, when it became clear that the public sectors of not even the richest countries aren´t able to preserve, rehabilitate, maintain nor own all of their tangible heritage assets, worth preserving.

A main contribution in this type of instrument is coming from the private sector, in form of funding these kinds of projects. The private sector acts as the investor, providing financing for whatever activities are necessary to rehabilitate and manage an asset of immovable cultural heritage. The length of the contract varies from country to country, but is carefully determined and agreed upon by both the public and the private partner, based on the conditions of the asset and the scope of the envisioned activities, all in purpose of meeting interests of both parties. The goal of these partnerships is to ensure preservation and revitalization of an asset, it´s continuous management and finally, it´s self-sustainability when it is returned to the officials.

Today, it is crucial to involve all players, not only from public and private sectors, but also from the third, civil sector. Mentions of public-civil partnerships in literature and research are minimal, since they don´t have influence in areas in which PPPs have originated from, which are public infrastructure and maintenance. In Eastern Europe there is a very small number of NGOs working in the area of protection and promotion of cultural heritage, while their number and significance is much higher in Western European countries. It has become clear that in order to achieve maximum results, it is necessary to ensure unimpeded collaboration between these three sectors and make it an established practice in managing these kinds of projects.

There are many concerns, raised by heritage advocates from the third sector, which are legitimate and which should be answered. Most of them are related to exploitation and degradation of assets, in favor of maximizing the return on investment. Others are questioning the validity of choice of private partners and the transparency of the whole process, and the true purpose behind them. The first step of introducing and implementing this new instrument is answering and resolving these concerns.

While in other parts of the world (Western Europe, North America, Australia) PPPs and PCPs are a standard practice in the field of preservation, revitalization and management of intangible cultural heritage, in Eastern Europe, and especially in the Balkans, these practices are at the very beginning and in some countries, like Serbia, almost inexistent.

* Corresponding author: R. Kristina kirstina.tina.radovic@gmail.com

A MICROBIAL SURVEY OF THE MUSEAL AIRBORNE FUNGAL BIODETERIOGENS

Rădulescu, H.C.[1,2 *]; Lazăr, V.[3]; Roşu, G.[4]; Popescu, C.[4]; Ispas, A.[4]; Ghiţuleasa, P.C.[1]

[1] National Research and Development Institute for Textile and Leather - INCDTP, Bucharest, Romania, [2] Doctoral School in Biology, Biology Faculty, Bucharest University, Bucharest, Romania, [3] University of Bucharest, Faculty of Biology, Department of Botany and Microbiology, Bucharest, Romania, [4] National Romanian Peasant Museum – MNTR, Bucharest, Romania

Tangible cultural heritage is exposed to multiple environmental risk factors able to affect its integrity and cultural function. Such factors are physical, chemical and also microbiological. Fungal biodeterioration is known to cause aesthetical and structural damage to materials (Cappitelli et al, 2010), the effect increasing in the case of improper depositing or accidents like floods or water leakage. At the same time, air contamination with different fungal spores can add more a risking factor for heritage goods safety (López-Miras et al, 2012).

Air quality it is a topic of interest for environmental applications, and health hazard issues. Thus for workers in a museum, where collecting, archiving and depositing are routine activities.Tracing of air biocontamination has a double significance: protection of their health from hazardous bio-aerosols and the control of the presence of biodeteriogens able to decompose materials.

The present paper will present a survey of the fungal communities detected in the air of an ethnographical museum in Romania conducted over a period of several months from cold to warm atmospheric conditions. Classical methods together with molecular tools (Michaelsen et al, 2009) of investigation of the fungal biodeteriogens will be presented.

Cappitelli, F., Pasquariello, G., Tarsitani, G., Sorlini, C. 2010. Scripta manent? Assessing microbial risk to paper heritage. Trends in Microbiology 18 (12), 538-542.

López-Miras, M., Piñar, G., Romero-Noguera, J., Bolîvar-Galiano, F.C., Ettenauer, J., Sterflinger, K., Martîn-Sánchez, I. 2012. Microbial communities adhering to the obverse and reverse sides of an oil painting on canvas: identification and evaluation of their biodegradative potential. Aerobiologia (Bologna) 29 (2), 301–314.

Michaelsen, A., Pinar, G., Montanari, M., Pinzari, F. 2009. Biodeterioration and restoration of a 16th-century book using a combination of conventional and molecular techniques: A case study. International Biodeterioration & Biodegradation 63 (2), 161-168.

* Corresponding author: H.C. Rădulescu clara.radulescu@certex.ro

HADES' HEAD, A GREEK HELLENISTIC MASTERPIECE FROM MORGANTINA, SICILY (ITALY)

Raffiotta, S.*

Archaeologist and Independent researcher, Enna, Italy

On January 29, 2016 a Greek Hellenistic terracotta polychrome head representing Hades has been repatriated to Sicily from United States of America. In 2013 the J.P. Getty Museum announced the 'voluntary' return of the sculpture, after verifying its illicit provenance.

In the Getty collection since 1985, the terracotta head was stolen in the late Seventies from Morgantina, the archaeological site in Sicily famous all over the world because of other important returns of stolen goods from USA: the archaic acroliths in Tempelsman collection (2009), the silver treasure in the collection of New York MET (2010) and the 'Getty Aphrodite' (2011).

The Getty Hades head was related to Morgantina after a research published by me in 2007 about some Greek terracotta votives in Aidone Archaeological Museum, where a little Egyptian blue painted curl of Hades beard in the Getty collection was housed.

So the blue curl in Aidone allowed Italy to claim the repatriation of the head from USA.

My presentation will focus on Hades' head history, from the theft to the return to Italy, considering that at the moment this event is in the spotlight of international press and scientific community.

Figure 1 shows an image of Hades head form Morgantina.

Figure 1. Hades head stolen from Morgantina and repatriated

Raffiotta, S Una divinità maschile per Morgantina, in CSIG News. Newsletter of the Coroplastic Studies Interest Group, no. 11, Winter 2014, pp. 23-26.

* Corresponding author: S. Raffiotta serenaraffiotta@gmail.com

PRESERVING CONTEMPORARY ART: THE PECULIAR CASE OF *PEQUENAS ESCULTURAS* BY ÂNGELO DE SOUSA, 1975

Raimundo, M.[1]*; Ferreira, J.L.[1,2]

[1] Department of Conservation and Restoration, Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa, Caparica, Portugal, [2] LAQV-REQUIMTE, Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa, Caparica, Portugal

Ângelo de Sousa (1938-2011), one of the major Portuguese artists, graduated from the School of Fine Arts in Porto where he became a professor from 1963-2000. His works cover various art forms such as painting, sculpture, drawing, photography and film. Ângelo, as he chose to sign his works, had a particular creative process. He frequently studied and experimented materials' properties, often documenting his tests. He assembled a large personal library, which includes several books on material science and technology, as well as on material-handling. For him it was also vital to have readily available materials and so he stored them in great quantities throughout the years, building an important material archive. Since the early 1960s Ângelo chose synthetic paints as his painting medium and his curious intellect led him to also explore plastics (such as acrylic, polystyrene and PVC) in sculpture. One example of this exploration is the sculptural set *Pequenas Esculturas*, created by Ângelo in 1975. It is composed of 27 small sized pieces made with heat modeled yogurt and butter General Purpose Polystyrene (GPPS) containers, with some of tem being painted.

This study uses an interdisciplinary methodology, combining social and natural sciences, namely history and documentation of contemporary art, history of plastics industry, and conservation science. Together, they work as a support to uncover Ângelo's creative and production processes and its impact on the preservation of *Pequenas Esculturas* sculptural set. Such approach is fundamental for managing the new challenges brought by the use of new materials and techniques by twentieth century artists; understanding the context of the containers production, placing them in the national and international panorama; and finally to disclosure the impact of the industrial and artistic production processes on the behavior of GPPS.

* Corresponding author: M. Raimundo g.raimundo.milton@gmail.com

HOW A DISTRICT CHANGES BY THE REHABILITATION OF AN INDUSTRIAL HERITAGE BUILDING

Ramos Ramos, D.*

Czech Technical University, Prague, Czech Republic

The transformations that have taken place on the reserve of steam locomotives in the city of Burgos since its construction in 1957 have been sporadic but very significant. This reserve, which is also known more colloquially as the "cocherón", "Hangar" or "roundhouse" is an icon in the railway industrial heritage due to its fan architecture. This fan shape has a clear relationship between aesthetic beauty and functionality (Santos Y Ganges, 2005).

The original use of the reserve is not as a garage, a place to park locomotives, it served as a garage for the technical functions. After the disuse of these facilities, coinciding with the end of steam power in favor of electric and diesel locomotives, these buildings fell into disuse, were demolished, converted into other workshops or abandoned. Fifty of them were built in Spain and nowadays, few are preserved (Lalana, 2011).

In Burgos case study, with the relocation of the commercial station in 1997, the reserve was abandoned, becoming as other garages and railways a residual element in the urban planning of the city. It was in 2004 when the Hangar would be protected under the Special Plan of the Station and will be restored in 2009 by the City Hall of Burgos as a new public facility for youthful use, here is when the district started the regeneration and different uses as concert hall, craftsmen market, theatre, workshops or conferences among others.

The recent and growing interest in our industrial heritage, mostly of the twentieth century, is beneficial for conservation. However, more support and awareness is needed by companies or institutions owning them. We must continue recovering and disseminating culture and a good way to do that is, as in the Hangar case, boosting the building with a new use. Contemporary industrial architecture makes itself worthy by writing about it. We have to understand why and how they were built so that we can understand and value the heritage.

Figure 1 shows an image of the building abandoned in 2004.
Figure 2 is the rehabilitation project done by AU architects where shape reminds the wagons.
Figure 3 shows an image of the building and surrounding area already rehabilitated in 2012

Figure 1. Before rehabilitation

Figure 2. Rehabilitation project

Figure 3. Area after rehabilitation

Lalana, J.L. 2011. "Los depósitos de locomotoras en España: una visión desde el patrimonio", pags. 188-205, Revista TST, 2011, nº20.
Santos Y Ganges, L. 2005. Burgos y el ferrocarril, estudio de geografía urbana. Dossoles, Burgos, pag, 392.

* Corresponding author: D. Ramos davidramos1988@gmail.com

ELECTROCHEMICAL STUDY OF A CONTEMPORARY OUTDOOR BRONZE SCULTPURE

Redondo-Marugán, J.[1*]; Ramírez-Barat, B.[2]; Doménech-Carbó, A.[3]; Doménech-Carbó, M.T.[1]; Cano, E.[2]; Osete-Cortina, L.[1]; Vivancos-Ramón, M.V.[1]

[1] Institut de Restauració del Patrimoni. Universitat Politècnica de València, Valencia, Spain, [2] Centro Nacional de Investigaciones Metalúrgicas (CENIM-CSIC), Madrid, Spain, [3] Departament de Química Analítica, Universitat de València,Valencia, Spain

Electrochemical techniques are very useful in the study of metallic objects since they allow characterizing their composition and the evaluation of their conservation status. Besides, these techniques are non-destructive and can be performed *in situ*. Voltammetric techniques mainly provide analytical information on the chemical and mineralogical composition while electrochemical impedance spectroscopy (EIS) gives information on corrosion processes.

In this work, we present an electrochemical study of the sculpture “Unidad Yunta”, by Pablo Serrano (1970). This artwork is a bronze sculpture exhibited outdoor in the campus on the Universitat Politècnica de València (Spain), so it is subjected to a marine enviroment. Patina composition was studied using Voltammetry of Immobilized Microparticles (VIMP), and also characterized by FESEM/EDX. The composition of alloy includes a relatively significant presence of lead. Emission lines of chlorine accompanying to copper and lead suggests the presence of atacamite, lauronite and cotunnite. EIS spectra were performed in two different areas of the sculpture; one of them is a smooth patina and the other one is rough. Measurements were carried out with a gel-electrolyte cell specially designed for *in situ* analysis. The preliminary analysis of the EIS spectra shows that the total impedance at the lower frequency limit, which is usually taken as an approximation of the protective capacity of the patina, is two orders of magnitude higher for the smooth patina. A deeper analysis of the EIS spectra will be discussed together with the characteristics of the patinas.

* Corresponding author: J. Redondo Marugán jorema@alumni.uv.es

THE MOSAIC PANEL FROM ORVIETO IN THE VICTORIA AND ALBERT MUSEUM: pXRF AND SEM-EDX AS TOOLS OF ASSESSMENT

Reggio, D.[1,2]*

[1] Centre for Research in Biological Chemistry and Molecular Materials (CIQUS), University of Santiago de Compostela, Santiago de Compostela, Spain (Current affiliation), [2] University College London, Institute of Archeology, United Kingdom (Affiliation during the research)

Prestigious wall mosaics decorated the façade of the gothic cathedral of Orvieto (central Italy). The panel depicting the 'Birth of the Virgin' (1365) is the last remained from the original cycle about the life of the Virgin Mary. Since 1891, the panel is part of the Collections at the Victoria and Albert Museum (London). A comprehensive conservation plan gave the opportunity to initiate a research focused on the Late Medieval and Renaissance mosaic technology in Italy. Further focus of the research was to assess the extent to which the portable X-ray fluorescence (pXRF) can be used to analyse historical glass. Limitations and advantages were tested by using the Corning Museum Reference Glasses A, B, C and D, and validated by comparison with more reliable laboratory techniques, as scanning electron microscopy and energy dispersive X-ray spectroscopy (SEM-EDX).

The aim of the study was the chemical characterisation of glass mosaic tesserae by using SEM-EDX and pXRF. *In situ* and *ex situ* analyses led to the investigations of 17 samples (SEM-EDX) and 121 samples (pXRF). This informs us about the production technology and gives insights on trade and provenance of raw glasses, pigments and opacifiers. It is argued that the majority of the tesserae (soda-silica-lime) are resulting from re-melting of different raw glasses in a period of technological transitions and geographical overlays. High potash and relatively high lead oxide link the Orvieto evidence to coeval examples of Tuscan mosaics, and to later productions from Rome. Lack of archaeological evidence for mosaic-making, however, does not allow further considerations about local production of glass (Arletti et al., 2011).

For almost all the coloured groups and sub-groups of tesserae, consistent relative amounts of minor and trace elements were achieved by pXRF. Further experimental research is needed to disentangle the limitations of the method.

Acknowledgements: This dissertation research has been possible thanks to the scientific support of Professor Ian Freestone (UCL, Head of the Wolfson Archaeological Science Laboratories), and the collaboration of Ms. Charlotte Hubbard, Head of the Victoria & Albert Museum Sculpture Conservation Studio, and Mr. Victor Borges, Senior Sculpture Conservator. Ms. Peta Motture, Chief Curator of the Medieval & Renaissance Galleries, kindly grated the permission to initiate the investigations.

Arletti, R., Conte, S., Vandini, M, Fiori, C., Bracci, S., Bacci, M., Porcinai, S., 2011. Florence baptistery: chemical and mineralogical investigation of glass mosaic tesserae. Journal of Archaeological Science, (38), n°1, pp. 79-88.

*Corresponding author: D. Reggio daniela.reggio@usc.es

NEW ANTIFOULING PRODUCTS FOR IN SITU CONSERVATION OF ARCHAEOLOGICAL ARTIFACTS LOCATED IN UNDERWATER ENVIRONMENT

Ricca, M.[1*]; Rovella, N.[1]; Comite, V.[1]; Crisci, G.M.[1]; Macchia, A.[2]; Ruffolo, S.A.[1]; La Russa, M.F.[1]

[1] Department of Biology, Ecology, Earth Sciences, University of Calabria, Via Pietro Bucci, Arcavacata di Rende (CS), Italy, [2] Youth in Conservation of Cultural Heritage, YOCOCU, Rome, Italy

This research is part of the national project entitled COMAS (Planned COnservation, ''in situ'', of underwater archaeological artefacts), concerning the degradation phenomena occurring during the permanence of archaeological items in underwater environment and their conservation in situ by means of new methodological approaches. In particular, the first topic of this study is to evaluate the rate and type of biological activity on marble stone specimens in seawater that, as well known, it changes according to the colonized substrate features. The second aim was to study the growth and the differences in biocolonization on treated stone materials and it is intended as a contribution to understand both the degradation forms resulting from biological activity and to test new protective products for the conservation of such materials, by using nanotechnology. Regarding nanotechnology, nanomaterials with antimicrobial and photocatalytic features were selected and undergone to experimental procedures with the aim of making antifouling products suitable for the protection of stone materials in underwater environment.

For the first time, nanomaterials (nano-powdered TiO_2, ZnO and Ag) were dispersed in siloxane wax (used as binder) in order to make possible the application of the products in underwater environment.

The experimental procedure was set up in the underwater archaeological park of Baia (Naples, Italy) in the area of the *Villa con ingresso a protiro*, on marble test-pieces, in order to compare the variation of biomass at increasing intervals of permanence in marine environment after being treated with different antifouling products. Laboratory procedures with the aim of assessing some specific properties of nanomaterials/binder mixtures as inhibitors of the marine biomass and their relation with the lithotype were carried out. In particular: colorimetric and contact angle measurements in addition with biological tests were performed. Later, several marble specimens were treated, anchored to a sample holder and immersed in the marine area of Baia. All samples were placed simultaneously and at increasing time intervals, some specimens were recovered and subjected to investigations. In particular, transmitted light optical microscopy and scanning electron microscopy (SEM) coupled with microanalysis (EDS) were used to study the biological colonization and the interactions with treated stone specimens, assessing the permanence of the antifouling products dispersed in wax and their effectiveness over time.

* Corresponding author: M. Ricca michela.ricca@unical.it

INTERVENTIONS IN INDUSTRIAL BUILDINGS AND GENERATED SPACES WAREHOUSE DISTRICT (SPEICHERSTADT) HAMBURG GERMANY AND DOCKLANDS LONDON

Rios, E. *

ETSAM UPM Universidad Politécnica de Madrid, Madrid, Spain

Industrial Architectural Heritage, and its intervention in buildings is today a topic widely spoken, but as its historical spaces are generated and operated in different industrial contexts is also important which had to develop and adapt to new buildings with industrial architectural heritage, and the new city.

For this two contexts declared World Heritage by UNESCO classified, and have the particularity of being in a revering against whose performances intervention in these contexts are considered the most important in Europe, regarding interventions in industrial areas, including l City Port (Hafencity), and Warehouse District (Speicherstadt), recovery of these ancient grain stores reused which keep even some architectural elements that refer to its industrial history, Occupying more than 26 hectares in the heart of Hamburg harbor which 300,000 m² were dedicated to storage area, designed by Ing. Andreas Meyer is 17 buildings constructed with a distinct style red brick neo - Gothic facade, showing the heritage value of these buildings.

It's large, austere naves of simple geometry, and alignment of its pillars helped to changes of use to museum, residential, commercial and office, the scale of its covered wooden trusses or iron, required interventions more considered as a structural reinforcement, repair, and rehabilitation for the new use of the building.

One of the buildings is the Elbe Philharmonic Hall (Warehouse Kaiser) being the most important port city, which after the Second World War this building was in ruins, then become a reservoir of cocoa, the austere building was reconstructed in 60, triangular plant and retaining the original structure in brick facade forming the foundation on which a skin of perforated glass overlaps contrasting in materiality, color and texture with brick, design *Herzog & de Meuron* architects who intervened London ancient central energy, Tate Museum, a similar context, creating new spaces and architectural landscapes for people with a new environment built with history and contemporaneous to the new city.

The spaces generated through these interventions in industrial buildings and revering fronts had to have a specific study, studying integrally providing them with a particular architectural design for each context, for the building itself, the person, and the city. In conclusion these industrial buildings generally have an architectural structure which is adaptable to different functions with different criteria for intervention, but will have a determining factor is its urban context determining the characteristics of each city needs people and its Historic Area therefore it constitutes a delicate operation.

Corresponding author: E. Rios luzelida14@gmail.com

CULTURAL MANAGEMENT FOR THE NATIONAL PALACE OF MEXICO

Rivero Weber, L.*

Conservator of the National Palace, Dirección General de Conservaduría del Palacio Nacional. Secretaría de Hacienda. México City, Mexico

The National Palace of Mexico is one of the most emblematic monuments of the country. From prehispanic times to the present, the Palace has been protagonist and witness of many of the most relevant events of Mexico´s history.

Under strict regulations, since the monument is the Presidential main protocolary venue, the daily use of the building as cultural infrastructure open to the public, represents a complex task, in which conservation activities, conservation master plan implementation, cultural management, and political issues usually converge.

Some of the experiences for the preservation and use of this relevant monument that is located on the heart of Mexico City Historic Centre, a World Heritage Site, will be discussed, in order to share our expertise in the topic of cultural heritage preservation and management.

* Corresponding author: L. Rivero Weber riveroweber@hotmail.com

PLASTICITY, MALEABILITY, INSTABILITY OF THE WAX IN CONTEMPORARY ART: REFLECTIONS ON CONSERVATION OF A CHANGING MATERIAL

Rodríguez González de Canales, E.[1]; Sánchez, A.[1]; Vanrell Vellosillo, A.[2]

[1] School of Fine Arts, Universidad Complutense, Madrid, Spain, [2] Museo Nacional Centro de Arte Reina Sofía (MNCARS), Madrid, Spain

The fascination of the contemporary art towards the search of new expression forms and the questioning of the human body authenticity have contributed to place the wax in a preferential position due to its capability of generating impressive and imitative similarities. The incredible allegorical and metaphoric features of the wax have influenced its constant update.

At the same time, there is nothing so instable, so variable like the physical state of a wax piece of art. Wax is a complex material that demands an experimental research by the conservator, looking for the physical part of the artistic object, and new approaches to conserve properly the meaning and parameters of the immaterial part.

In this article, as a part of the research of a doctoral thesis, the first outcomes of a conservation methodology are exposed, as a tool to solve the different issues set out.

* Corresponding author: E. Rodríguez González de Canales elenro08@ucm.es

STUDY FOR THE APPLICATION OF A CLEANING SYSTEM FOR THE BRONZE AGE FAUNAL SET OF CABEZO REDONDO SITE

Romero Giner; I.A.[1*]; Iborra Eres, M.P.[2]; Martínez-Valle, R.[3]

[1] University of Valencia (UV), Valencia, Spain, [2] IVC+R CULTURARTS Generalitat Valenciana (IVC+R), Valencia, Spain, *[3] IVC+R CULTURARTS Generalitat Valenciana (IVC+R), Valencia, Spain*

The aim of the present study was todetermine a method for the cleaning of the material from the Bronze Age deposit of Cabezo Redondo (Villena, Alicante). This deposit has provided an interesting faunal set that stillhas to be studied, as it displays a wide specific diversity with predominance of domestic mammals of average height, together withbird remains and microfauna.

The recovered material showed diverse conservation issues due to the fact that all remains were covered with sediment formed by plasters, slimes and clays that impededthe further study of the faunal set.

The large quantity of material to be treated and the good cohesion presented led to the rejection of individual cleaning in favor of a system that allowed the treatment of large number of remains simultaneously.

The main purpose of the study was thereforeto find a suitable system for the cleaning of the remains that would not concern the bone's structure and would allowarcheologists developfurther taphonomic studies. For the reasons exposed, it was chosen to accomplish cleaning tests through immersion in deionizedwater together with restoration products that facilitated and improved the detachment of the sediment without producing alterations in the remains.

Two types of products suitable for immersion were chosen to undergo the study: detergents and chelating agents. Variables during testing were timing, type of immersion, proportions and combination of products.

Results allowed the selection of a product, which being applied in a determined proportion and under controlled conditionspermits the cleaning of the remains in large quantities without provoking any alterations that would impede further study.

*Corresponding author: I.A. Romero Giner iarogi@alumni.uv.es

THE "*THERMAE ROMANAE*" OF REGGIO CALABRIA (SOUTH ITALY): AN OPEN AIR LABORATORY FOR TESTING NEW CONSERVATIVE STRATEGIES

Rovella, N.[1]*; Comite, V.[1]; Ricca, M.[1]; Ruffolo, S.A.[1]; Urzì, C.[2]; Arcudi, A.[3]; Silvestri, C.[3]; Macchia, A.[4]; La Russa, M.F.[1]

[1] Department of Biology, Ecology and Earth Sciences (DiBEST), University of Calabria, Arcavacata di Rende (Cs), Italy, [2] Department of Biological and Environmental Sciences, University of Messina, Messina, Italy, [3] Conservation Cultural Heritage (C.B.C.), Rome, Italy, [4] Youth in Conservation of Cultural Heritage, YOCOCU, Rome, Italy

The *Thermae Romanae* are located on the Reggio Calabria coast (Calabria, Italy) and were founded between the I and II century B.C. This archaeological area represents one of the greatest evidence of Roman architecture in South Italy and it includes ancient imperial ruins of thermal sources. The imperial bath complex was built around three principal rooms: the *calidarium* (hot bath), the *tepidarium* (warm bath) and the *frigidarium* (cold bath), which were connected through different entrances to a central room. The latter is decorated by a suggestive Roman floor mosaic in geometric design, with black and white tesserae, dating between the II and III century A.D.

Unfortunately, the floor mosaic is seriously affected by biological colonization producing a superficial patina that damaged the tesserae. The state of conservation suggested the necessity of a focused and innovative intervention able to protect the mosaic and to reduce the maintenance works over the time. For this reason, new generation products constituted by nanoTiO_2 and Ag were tested thanks their self-cleaning and antimicrobic features.

The more suitable experimental strategy was selected on the basis of the biodeterioration phenomena and the tesserae composition. The new formulates were evaluated preliminarily in the laboratory in terms of stability parameters (e.g. chromatic variations and antimicrobic capability), hydrophobic and self-cleaning features.

In the subsequent and main phase, the experimentation was carried out in the archaeological area. In particular, the nanoproducts were applied on samples of marble plates, coherently with the most common composition of the white mosaic tesserae. The formulates were monitored monthly for six months by means of colorimetric measurements to detect probable chromatic variations and biological samplings to check the antimicrobic effect of the nanoparticles.

This research is funded by POR Calabria FESR project "NANOPROTECH" (NANO PROtection TEchnology for Cultural Heritage).

* Corresponding author: N. Rovella nataliarovella@gmail.com

CONSERVATION OF THE ICON "SAINT ALEXANDER NEVSKY" FROM THE PREVIOUSLY ABANDONED ORTHODOX CHURCH OF ALEXANDER NEVSKY CHAPEL (PUDINAVAS VILLAGE, LATVIA)

Rozentale, I.*

Painting restorer, Latvian Association of Restorers, Riga, Latvia

During Soviet occupation, Christianity was undesirable, even prohibited in Latvia. Therefore, many churches were closed, used for other purposes (as livestock manure sites, fertilizer storage room etc.). A lot of valuables were stolen and churches vandalized. After regaining independence, some churches recovered their congregations, but most of them are poor, and people in rural areas are decreasing. In some churches (especially in Latgale - one of the Latvian regions, where there are a lot of Orthodox and Catholics churches), are heritage valuables that dies.

As an example of this is the icon of Alexander Yaroslavich Nevsky, from Alexander Newsy chapel. The chapel was built at 1866) next to Holy Virgin Shelter Orthodox Church (Pudinava village, Latvia). During the last fifty years, the chapel became in critical condition, with damages in the roof, high humidity and frost processes during winter.

In 2013 the icon was moved to the Art Academy of Latvia restoration department. But restoration of painting started only since 2016. Due to dampness, the roof was damaged and the surface layer is almost lost. Canvas at the bottom of the painting was very damaged, too, and some parts were lost, fissured and the canvas deformed – about 8 cm. Paint and primer layer were 70% lost. Canvas frame was also fractured. The object is still in the process of restoration (April 2016). Painting was removed from the frame and sandwiched on the adjustable belt system frame.

Such kind of restoration is expensive. So it is important to preserve the rest valuables from damage. It is important to establish a common framework, bringing together both the National Heritage Protection inspectors, both restorers and architects and of course the church congregation and the local county executives whose cooperation could find the best ways to protect cultural property, within their small budgets. Because sometimes it's not necessary to invest lot of resources. Currently, it takes place only at the level of conversation, without active operations. Therefore, it should take the young professionals in cooperation with experienced specialists (who unfortunately are lack in Latvia). Some forerun have already been established. More and more students are involved in practices and projects, working with real objects. They work with interior object in churches and castles, conserve object and buildings.

Figure 1. Icon of Alexander *Yaroslavich* Nevsky

* Corresponding author: I. Rozentāle rozentaleieva@inbox.lv

MATERIAL INVESTIGATION OF A MEDIEVAL ILLUMINATED PARCHMENT EXPLOITING THE LABEC–INFN XRF SCANNING SYSTEM: IDENTIFICATION OF PIGMENTS, INK AND GILDING DECORATIONS

Ruberto, C.[1,2,3*]; Mangani, S.[2,3]; Mazzinghi, A.[1,3]; Czelusniak, C.[1,3]; Palla, L.[4]; Massi, M.[1]; Giuntini, L.[1,3]; Castelli, L.[1]; Mandò, P.A.[1,3]; Taccetti, F.[1]

[1] INFN- Sezione di Firenze, Sesto Fiorentino (Fi), Italy, [2] University of Florence, Chemistry Dept, Sesto Fiorentino (Fi), Italy, [3] University of Florence, Physics and Astronomy Dept, Sesto Fiorentino (Fi), Italy, [4] University of Pisa, Physics Dept, and INFN- Sezione di Pisa, Pisa, Italy

In the field of illumination techniques material analysis is particularly problematic, as it is not possible to remove even tiny fragments of paints, what may instead be often allowed for the analysis of paintings on wood, canvas or walls. For the material investigation of book decorations and miniatures, therefore, only strictly non-invasive techniques can be used. The X-Ray Fluorescence (XRF) technique is very well suited for this task, as it allows for multi-elemental, non-invasive, and *in-situ* analyses, providing valuable insight regarding the material composition of artworks.

The materials under study, even when apparently uniform, may often have local in homogeneities, on scale of hundreds of microns or smaller, which are not easily identified by visual examination. Therefore ‘‘spot’’ analysis can result in misleading information on the composition of the material under study. To overcome this problem, a scanning XRF spectrometer has been recently developed at the LABEC laboratory of INFN (National Institute of Nuclear Physic) in Florence. Indeed, reconstructing elemental maps over a whole surface leads to achieving much more significant and reliable results.

The results that will be presented refer to an illuminated manuscript, an Antiphonary, dating from about AD1340.In particular, we examined a large fragment consisting of avellum sheet, partly restored at an unknown date by replacing a missing or damaged portion of parchment. It is a musical notation composed of a system of six tetragrams on each page, with neums and text of the chant written in *littera rotunda*; it is decorated with calligraphic initials and a figured illuminated letter.

The study here reported allowed us to characterise most of the materials and in some cases to evaluate their conservation state. Indeed thanks to the XRF *imaging* it was possible to identify the painting palette, also for pigments composed by light elements (e.g red lake), the nature of the ink and the gilding techniques. As to the last, the elemental distribution maps allowed us to discriminate traces of original materials (gold metal foil), hidden by the most recent restoration pigment (purpurin, a yellow tin-based pigment used since the late XIV century).

* Corresponding author: C. Ruberto ruberto@fi.infn.it

DIAGNOSTIC ANALYSIS FOR THE RESTORATION OF THE FONTANA DI TREVI IN ROME

Ruffolo, S.A.[1*]; Cerioni, A.M.[2]; De Santis, M.[2]; Alvarez de Buergo, M.[3]; Crisci, G.M.[1]; La Russa, M.F.[1]

[1] University of Calabria, Department of Biology, Ecology and Earth Science, Italy, [2] Sovraintendenza Capitolina, Roma, Italy, [3] Geosciences Institute IGEO (CSIC-UCM), Madrid, Spain

The Fontana di Trevi represents one of the most important monumental fountain of the city of Rome. The monument has undergone a restoration in 2014-2015. In order to choose proper interventions, an extensive diagnostic analysis was planned, before and during the restoration. This activity was carried out in collaboration with the restorers and with the restoration project manager.

In order to check the state of conservation of the stone materials, several micro-samples have been taken and then subjected to several analytical techniques, such as petrographic, mineralogical and microchemical analysis. Results suggested the degradation processes taking place into this characteristic microenvironment, in which water and stone are constantly in contact, originating a continuous solubilisation-deposition effect within the stone materials, this can heavily affect the original shapes of the monument. In addition, the analyses allowed distinguishing between the original materials and those superimposed during previous restoration procedures.

Moreover, there was a debate among the stakeholders about the colors of some surfaces. One issue regarded the orange colored niche were the statue of Oceano is located. There was a doubt about the origin of such color, since it was unclear if it is original or it is consequence of a degradation process. The scientific investigation, carried out by checking the stratigraphy and the presence of pigments, revealed the presence of red ochre, therefore a deliberate intention to give a warmer tone to this architectural element. Similar issues have been faced on other portions, such as on some statues, or on plasters. In some cases the colored layers have been identified as a degradation product, therefore, they have been toned down in order to keep the overall harmony of the monument.

* Corresponding author: S.A. Ruffolo silvestro.ruffolo@unical.it

CASE STUDIES OF THE UTILITY OF THE APPLICATION OF NEW THREE-DIMENSIONAL TECHNOLOGIES FOR THE STUDY AND DIFFUSION OF HERITAGE FROM A HISTORICAL - TECHNICAL PERSPECTIVE

Ruiz Bazán, I.[1*]; Vita, G.E.E.[2]

[1] Universidad de Zaragoza, Zaragoza, Spain, [2] Politecnico di Milano, Milano, Italy

In recent years, the world's cultural heritage has become one of the protagonists whom new technologies restitution in three dimensions have focused its efforts. Although this technology is not born to be applied in cultural heritage ambiance but as a result of the industrial production needs its use in this field is demonstrated increasingly inescapable.

In this article, we will discuss the various applications of convergent photogrammetry in four different cases. In the first one, we study its implementation in phase of project design in the intervention of restoration of the Chapel of the Purification in the Church of Carmine in Milan (Italy), where we will explain the usefulness of this technology applied to the process of drawing up maps identifying material damage, diseases and intervention proposals. In the second case is presented the utility of the three-dimensional reproduction made of the paintings which are hidden in the Collegiate Church of Santa Maria in Daroca (Spain) and finally we present the application of this technique as a possibility of diffusion of the research made in the research projects “Reconstrucción y restauración en España 1938-1958. Las Direcciones Generales de Regiones Devastadas y de Bellas Artes”, (ref. HUM 2007-62699) and “Restauración monumental y desarrollismo en España 1959-1975” (ref. HAR2011-23918).

The confrontation of these three different cases in which the same technology is applied in various stages of the process of heritage conservation allows to study new perspectives on its usefulness, such as delineating its limits and requirements and remark that its ultimate aim is to contribute to a better understanding and diffusion of heritage to promote its conservation.

Finally we establish a dissertation on the different types of files produced with this method as well as an overview of the various European networks which are directing their efforts to collect all this material which unfortunately does not yet have an homologation which could allow its use by any researcher

* Corresponding author: I. Ruiz Bazán ireneruizbazan@gmail.com

VALORISATION OF THE ROMAN DOCK OF CASTELLABATE

Russo, M.*

Department of Architecture and Industrial Design "Luigi Vanvitelli", Second University of Naples, Aversa, Italy

Today the biggest museum in the world is in danger. This is the warning on the manifesto published by UNESCO against the raids and destructions of the underwater assets. The water covers the 70% entire planet, UNESCO has a great attention to this kind of cultural heritage because it is the most delicate and subject to be plundered. Several underwater archaeological sites are in a critic situation and most of the statues and decorations was moved to land-museum eliminating the *in situ* value of these artefacts, against the provision of the UNESCO Convention on the Protection of the Underwater Cultural Heritage in 2001 as for the famous Italian underwater site of Baia in the Phlegraean Fields.

In Italy there are several underwater archaeological site due its position and importance in the Mediterranean Sea. *San Marco di Castellabate* is a suburb of *Castellabate*, it is a small town along the coast in the *Cilento* with 1.200 inhabitants, in the Southern Italy, it is located between two important archaeological presences as *Paestum* to north and *Velia* to south, both are Greek archaeological sites. The presence of this heritage could be a great opportunity for the development of the town towards the seaside, the only project on the coast is the touristic hub, a project built in the 1958 based on the separation between the coastline and the city; the archaeological remains were sacrificed during the construction of the dock for tourist where there were no attentions for the cultural heritage.

The paper tries to identify a possible solution for the valorization of the underwater archaeological site in *Castellabate*, with the secondary goal of testing the collaboration between the architect and the archaeologist, almost non-existent in Italy differently from Europe. The project is developed with the collaboration of the *Soprintendenza della Campania* (the public office that manages the archaeological sites) and an archaeologist who studied the underwater site. The main aim is to design a structure that can monitor the submerged remains and permit their fruition, an element to revitalize the waterfront which is currently represented by a simple path along the sea, interrupted from the tourist hub, private structures that invade the public space and the beach with its size.

The solution is based on a medium-size building that allows to "visit" the remains throughout the entire year and during the night, integrating with the economic fabric and with local boaters.

The structure is part of the landscape but in anonymous way, the concept of the reversibility, always linked to architectural projects on the archaeological site, is interpreted in an original way due the possibility of disappearing during a coastal storm or maintenance works. A solution based on sustainable tourism, a non-invasive proposal with the final goal to become a new symbol for the citizens who living a sterile relationship with the sea from too years.

* Corresponding author: M. Russo archmarcorusso@gmail.com

PORTUGUESE LIMESTONE NANOCOATINGS USING TIO_2 THROUGH SPRAYING OR SUPERCRITICAL CO_2

Sabala, A.[1]; Dionísio, A.[2*]; Matos, H.A.[2]

[1] FCT-UNL, Almada, Portugal, [2] CERENA/ IST-ULisboa, Lisbon, Portugal

Stone is frequently exposed to different deterioration agents, either natural, either induced by Human action. Among these factors stands out the urban environment, and the air quality in particular, as well as biological colonization, which may cause or accelerate the deterioration of several heritage elements. Such exposure will accelerate and trigger degradation processes which lead to chemical and physical deterioration of the stone material and also, in some cases, to soiling or blackening. Blackening of stone material is a visual nuisance resulting from the darkening of exposed surfaces and as a result black patinas and/or crusts are often formed reducing the visual information on architectural details and ultimately obscures the colour, texture and any shadowing detail. Therefore the protection and conservation of Cultural Heritage is an important issue affecting countries all over the world.

The development and application of self-cleaning surface treatments could be a significant improvement in the conservation, protection and maintenance of Cultural Heritage. Titanium dioxide (TiO_2) can be used for self-cleaning of stone surface coatings due to its photo-induced characteristics activated by UV radiation from sunlight: Photocatalyst and hydrophilicity will perform as active and preventive protection system and in turn limit/reduce cleaning and maintenance activities as well as the presence of degradation processes and lastly architectural heritage maintenance costs.

This research aims to evaluate the effectiveness of TiO_2 nanocoatings applied directly by spraying or supercritical CO_2 on a Portuguese limestone -Lioz. Lioz is widely used in Portugal and abroad in interiors and exterior structures of monuments, buildings and sculptures.

The criteria for assessing the effectiveness and potential risks of the coated and uncoated Lioz -limestone included changes in the chromatic parameters, static contact angle, water absorption by capillarity, modification of the morphology and the composition of the surfaces. Results indicate the possible use of TiO_2-based treatments in historical and architectural surfaces with no significant changes to its original appearance. Moreover it has been shown that wettability and water absorption by cappilarity of limestone surfaces was modified.

This preliminary studies also shown a slight advantage in using supercritical CO_2 instead of classical spraying, especially since a more uniform and transparent coating is achieved using that technique.

* Corresponding author: A. Dionísio amelia.dionisio@tecnico.ulisboa.pt

EARTH AND OCHRE PIGMENTS: DIFFERENT COMPOSITIONS - DIFFERENT COLORS

Sáenz Martínez, A.*; San Andrés, M.; de la Roja, J.M. ; Chércoles, R.

Faculty of Fine Arts. Complutense University of Madrid. Madrid, Spain

The colorimetrical properties of pigments are related to their chemical composition and certain physical properties as, for example, morphology and particle size, refractive index, and so on. Some artistic pigments are categorized under a general terminology, which includes a wide range of compositions and colors. This is the case of natural earth and ochre pigments, which are widespread in nature. All of them contain both oxides and oxide-hydroxides of iron beside different aluminosilicates. However, the nature and percentage of these components can vary and, obviously, these variations can affect color. On the other hand, the binder used to apply the pigment can also influence color.

In this paper, several commercial pigments corresponding to the group of earth and ochre pigments have been analyzed and the relationship between their composition and color has been established. These same pigments have been agglutinated with linseed oil, arabic gum, gelatine and lime plaster to prepare pictorial layers and carry out colorimetrical measurements of them. In all cases, the proportion pigment-binder was controlled as well as the thickness of every pictorial layer.

The analyses of pigments have been accomplished by different analytical techniques. Their composition and morphological properties, both size and shape of their particles, have been studied with Scanning Electron Microscope (SEM-SE). Besides, FTIR analyses were carried out to study the infrared spectrum of absorption of every pigment and their molecules structures were studied by X-Ray Diffraction (XRD). The colorimetrical measurements have been achieved with a spectrophotometer on powder pigments and its corresponding pictorial layers, and the results obtained have been represented on the space color CIE-lab and in reflectance curves.

This research has been supported by Geomateriales 2 (S2013/MIT-2914) Programme and Fondos Estructurales (FSE y FEDER). Collaboration Grant (2015-2016) awarded to Águeda Sáenz Martínez by Ministerio de Educación, Cultura y Deporte (Spain).

* Corresponding author: A. Sáenz Martínez agsaenz@ucm.es

ORGANIC AND MINERAL COMPOSITION OF ANCIENT BONE TISSUES FROM OLD HERZEGOVINA

Salatić, S.[1]; Borca C.[2]; Parker A.[3]; Dučić T.[4*]

[1] Museum of Herzegovina, Trebinje, Bosnia and Herzegovina, [2] Swiss Light Source, Paul Scherrer Institut, Villigen, Switzerland, [3] STFC-Rutherford Appleton Laboratory, Oxfordshire, UK, [4] ALBA Synchrotron Light Source, Barcelona, Spain

Domaševo is an antic colony from the middle ages, located in the Old Herzegovina (now Bosnia and Herzegovina) and it was first mentioned in the 10th century document Porphyrogenitus written by Constantin VII in the district of Ljubomir within the region of Travunia. Travunia (Serbian: *Travunija*, Greek: Τερβουνια, *Terbounia*) was a medieval region, administrative unit and principality, which was part of Medieval Serbia (850–1371). Within the historical region there are three churches which contain several monumental medieval tombstones (called "stećci"). Stećci have been nominated to the UNESCO World Heritage List as Joint Cultural Heritage by the four countries Serbia and Bosnia and Herzegovina and Montenegro in 2009. Based on current data, it is likely that the churches were built in the late 15th and early 16th century. One of these is Saint Peter Church, an old Orthodox Christian church founded by Duke Petar Zotovic in the 15th century and in his honour was believed to be buried in the church. It is known that Zotovic suffered from a disorder of bone mineralization, which was identified in one of the specimens after exhumation. The DNA analysis is running in parallel to confirm the identification of Zotovic.

The objective of our study was to use Raman spectroscopy as well as the micro-X-ray fluorescence (EDXRF) analysis to investigate the characteristics of these ancient human bones originated from 400-year-old tombs. Providing a more precise dating, as well as to compare the anthropological and physical-chemical analysis of the middle age population, it is necessary to do further analysis.

Two different analytical chemical methods were used in this study: EDXRF- to allocate chemical composition and Raman spectroscopy to provide chemical specific make-up of the samples. By using these complementary techniques we are able to characterise both the organic and mineral components making up bone and establish differences between the ancient healthy and diseased bone tissues.

Excavated human bones from Old Herzegovina dated from the middle ages showed differences in the elemental occurrence and concentration as well as in the calcification. In this study we have found out that the heavy metals Ti, Mn and Fe are present in some of bones samples. Secondly, a male skeleton showed some unusual changes in the bio-mineralization, especially in the parts with visible deformations. These preliminary results are giving us more information about environmental and habit influence in the middle edge life in Domaševo.

* Corresponding author: T. Ducic tducic@cells.es

NEW TECHNIQUES FOR DOCUMENTATION AND VIRTUAL RECONSTRUCTION. SANTA MARÍA DE LA ALMUDENA CHURCH IN MADRID (SPAIN)

Salazar Jurado, A.*

Superior Technical School of Architecture of Madrid (ETSAM-UPM), Madrid, Spain

Santa Maria de la Almudena Church was the first Catholic Church situated in Madrid. Unfortunately, in 1868 it was knocked down due to an urban remodeling project. Although it was an important building in Madrid cultural heritage, just two graphic documents confirm its existence: an 1830 model by Gil de Palacio and a picture took by Laurent.

In order to get the elevations representing the church, I turned to Agisoft Photoscan, a software product that performs photogrammetric processing of digital images generating 3D spatial data. From a collection of only 20 pictures taken from different points of view, the software itself generated a 3D model processing those digital images.

The main advantage of this innovative technique is the fact that you only need portable equipment - a digital camera and a standard computer are enough. In addition, complete spatial information is provided, which can be used to reach different goals.

Digital documentation of cultural heritage is essential to evaluate restoration and consolidation of architectural heritage. Taking the advantage of new technologies makes easier our work as architects generating a more complete information document.

Figure 1 shows an image of Agisoft PhotoScan software interface. The model allowed me not only to get dimensions but also materials and the area damaged.

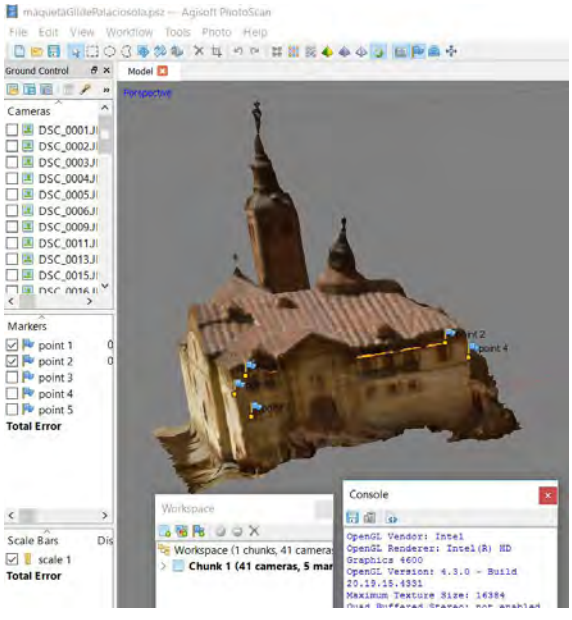


Figure 1. Santa María de la Almudena Church. Photoscan 3D model reconstruction

* Corresponding author: A.Salazar Jurado anasalazartt@gmail.com

CONSERVATIVE RESTORATION OF PAINTING ON SLATE OF "MADONNA DELLE GRAZIE". DESIGN AND CONSTRUCTION OF A NEW SUPPORT IN GEOPOLYMER FOR CULTURAL HERITAGE IN SLATE

Salvaggio, G.[1*]; Lazzara, G.[1]; Inguì, G.[1]; Tumminello, A.[1]; De Luca, M.[2]; Agnello, F.[1]; Macchiarola, M.[3]; Saccani, I.[4]; Greco, E.[5]

[1] University of Palermo, Palermo, Italy, [2]Superintendent BB. CC. AA. Of Palermo, Palermo, Italy, [3] Institute of Science and Technology for Ceramics (CNR-ISTEC), Faenza (RA), Italy, [4] CESMAR7, Verona, Italy, [5] University of Catania, Catania, Italy

This work aimed to a minimal restore intervention of the painting "Madonna delle Grazie" on slate, located in the Mother Church of Polizzi Generosa (PA).

The restoration was performed to improve conservation and to preserve the film paint. The art craft has been made with the technique of oil on slate, it is one of several examples of paintings on this stone material which are located in Sicily, but very few are the cases of restoration methodology described.

The choice of the materials and methods used has been accompanied by a long period of study, following the logic of a reversible intervention. The survey of the environment parameters, such as relative humidity and temperature, showed extreme values where the art craft will be preserved, so the choice of materials took in consideration chemical and physical stability according with environmental variables.

The historical art research has identified the art craft belongs to one up 94 "Madonna delle Grazie" on slate by Pietro Antonio Novelli between 1614 and 1616, with a design provided by the client Don Brignone, and with the support material from Region Liguria.

Diagnostic analysis carried out have identified the materials composed the slate, allowed to achieve the minerals inside it. Following the studies: film paint's stratigraphy by SEM microscopy with EDS, to indentify the layers of the film paint and its composition; X-ray on the slate support and on the mortar found back, to know the nature of crystalline phases present on both; thermo-gravimetric analysis on the mortar to look for the quantity of the constituent elements; Multispectral analysis on the painting to observe the parts not visible in the visible spectrum; X-ray fluorescence on the film paint to understand the components of the paint layers;

It was observed, with the survey multispectral analysis the absence of preparatory drawing, and with the X-rays fluorescence was detected the pigments present.

The 3D scanning has allowed obtaining high-resolution data, that it could be used for further preservation scopes. In addition, the degradation mappings has been obtained with the 3D models that the current software do not process in automatic.

During the conservative intervention phases, different innovative materials have been applied in the field of restoration, such as the Pluronic and microfiber Evolon. Finally a new support has been realized for slate art crafts, moreover that is an environmentally friendly material, the geopolymer.

* Corresponding author: G. Salvaggio gius.sal@gmail.com

REUBICATION PROPOSAL OF THE MAYOR ALTARPIECE OF SAN FRANCISCO IN SAN ESTEBAN DE GORMAZ (SORIA): VIRTUAL RESTORATION AND VIRTUAL RECONSTRUCTION OBTAINED THROUGH 3D MODELING

Sánchez, M.*

Patrimonio Virtual, University of Alicante, Alicante, Spain

This paper intends to be a sample of the use of new technologies applied to Cultural Heritage for the dissemination of knowledge, both theoretical and practical, as Conservation and Restoration methods. Photogrammetric resources have been considered when generating three-dimensional models (SOLER, 2013), which have finally been created through 3D modeling including a 3D animation in order to demonstrate the utility of virtualization and its importance in Conservation of Cultural Heritage.

The work under consideration is the Mayor Altarpiece from the old Convent of San Francisco - todays Church of San Esteban Protomártir - in San Esteban de Gormaz (Soria), built in 1628 in one of the most important workshops of the Diocese. In 1985 renovation works and refurbishment of the church had uncovered wall paintings in advocation to the founder of the Franciscan Order behind the wooden reredos, being one of the few examples of painted altarpieces preserved in Spain. By this historic event, the wooden altarpiece was transferred to a little shrine in the same locality where is currently disassembled, a new location that has tended to disfavor the condition of the altarpiece. Knowing the impossibility of an immediate intervention, this Cultural Property is a great example of heritage to apply the digital techniques previously mentioned to carry out virtual restoration and virtual reconstructions as hypothesis for reubication proposals which aim to attempt visual recovery and potential unit without counterfeiting. Furthermore, the lack of information, documentation and examples of virtual restoration and 3D models of this kind of heritage - as it is known that new technologies and techniques are mainly focused on archaeology – has been a huge challenge that has enabled to advance in different areas of digital heritage, becoming a possible reference in future projects.

Soler, E. 2013. Levantamiento fotogramétrico y modelización tridimensional del santuario de Nuestra Señora de la Fuensanta. Arquitectura Técnica. Universidad Politécnica de Cartagena, 35-38.

Figure 1. Virtual reconstruction and reubication proposal of the wooden altarpiece on the church

* Corresponding author: M. Sánchez msanchezy2015@gmail.com

HOME MOVIE NETWORK

Sánchez-Dehesa, C.[1*]; Vivancos, S.[2]

[1] Rollos de familia, Vitoria, Spain, [2] Memorias Celuloides, Región de Murcia, Spain

The home movie director shoots everything that surrounds him. Home movies chronicle family live, but also social practices, rituals, festive events, performing arts, and much more. The home movie director has a curious eye, sometimes well-meaning, at other times incisive or even cruel, but always fresh and without the economic pressure that commercial cinema is under.

These narrations are valuable resources to study the 20th century society, and they are getting lost. We have to learn from the past and realize that these documents are going to be the basis of the future research of our time.

Now is the moment of recover the home movies from the last century, now that we still have the technology and the knowledge, now that there are still living witnesses to those films, who can tell us where, when, why and how things happened.

The Home Movie Network was founded in 2015 to join all the projects dedicated to rescue, conservation and distribution of these kind of documents. Through individual and collective work, this network intends to sensitize the authorities, but mainly the public - the true protagonists of this intangible cultural heritage - to the true value of the home movie documents. Our principle challenge now is the development of a global home movie database to make these recovered documents available for research.

* Corresponding author: C. Sánchez-Dehesa csdehesa@gmail.com

COLLECTION OF WAX ANATOMICAL MODELS OF THE VETERINARIAN MUSEUM FROM THE COMPLUTENSE UNIVERSITY OF MADRID SETUP OF CLEANING SYSTEMS FOR ITS CONSERVATION

Sánchez Ortiz, A.[1*]; Rodríguez González de Canales, E.[2]; Cantos, O.[3]; Sánchez de Lollano, J.[4]

[1] Faculty of Fine Arts, Complutense University of Madrid, Spain, [2] Faculty of Fine Arts – Faculty of Veterinary, Complutense University of Madrid, Spain, [3] Spanish Institute for Cultural Heritage (IPCE), Madrid, Spain, [4] Faculty of Veterinary, Complutense University of Madrid, Spain

The XVIII-XIX century wax sculptures, belonging to the anatomical models collection of the Veterinarian Museum of Complutense University of Madrid, raise certain issues that set a challenge to the conservator, arisen from the special physical-chemical features of this material. Its hydrophobic nature, high attractive force of the dirt and extreme physical structure fragility are some of the concerns that need to be solved.

The cleaning of these surfaces, with different orography and finishes, has been done using previously tested aqueous systems. This permitted to remove the deposits of dirt while keeping the original varnish and taking care of, among others, the minimal intervention principle.

This proposal exposes, for every single case, the methods used for the materials and aqueous systems selection, and new future challenges are set.

Figure 1. Cleaning test. Wax anatomic sculpture. The Veterinarian Museum. University Complutense of Madrid

This work has been done in the context of the R&D project: *"Ceroplastics in Veterinary: Documentation, materials characterization and conservation-restoration methods in the Complutense collection"*, Economy and Competitivity Ministry. HAR2013-42460-P.

* Corresponding author: A. Sánchez Ortiz alicisan@ucm.es

NOW DAYS MATTER DOES NOT MATTER!

Santabárbara, C.*

University of Zaragoza, Spain

According to Benedetto Croce's (1866-1952) idealist theories, and that were later followed by Cesare Brandi (1906-88), the work of art used to be identified with the finished physical object. The authenticity of the piece was based on the matter in which it had been created, and that transported the viewer to a previous period. Is not a coincidence that the theories that sustained the fundamental value of matter arouse mainly in Italy, were cities are the scenery of the past, and the value of art is identified with history, and also with the inherited cultural identity.There has traditionally existed a fetishism attitude towards the matter, considering it almost sacred, as something that could not be altered because in itself resided the authenticity of the piece of artwork, and it was considered original for its uniqueness and exclusiveness. Now days, this makes no sense because art has become immaterial. It is generated within technological contexts and its value has changed completely; it does not have a physical value anymore, it has become image, sensations and experiences (Rain Room, by random International, 2013).

We can no longer perceive the value of history in an object that has not been made by the hand of the artist, on the contrary, it has been created based on a design that was generated by a software, with precise measures and exact colours, and it is later reproduced by a machine or mass-produced. The elements that are used in creating a piece of art are often bought at a market or industrially manufactured, loosing in this way their "aura" (Walter Benjamin, 1936). The "creative" gesture of the artist does no longer intervene in the process of making the piece of artwork, therefore, what can stop it from being reproduced, made or printed again and again? In those pieces of art which are no longer "autographs", authenticity does not reside on the original matter, but in the idea, in the intention with which it was created (Heinz Althöfer, 1985).

Now days, art is a different kind of communication. It is no longer a formal representation of reality, but it goes further, it transmits, communicates, provokes and, above all, creates experiences. It is for this reason, that if the matter, in which the piece of artwork was created, ages, brakes and gets dirty, art stops "working".

In the German theories we find that Hiltrud Schinzel, 2003, talks about recuperating the "*Kunstwollen*" (the artistic willpower), which had been previously exposed by Alois Riegl (1858-1905), and that surpasses the critique restoration. In the same way Edmund Husserl (1859-1938) in his phenomenology theory brings us closer to the experience, emotion and sensations that art has to offer, aiming to recover the intention of art, and rescuing the sentiment, the thought and the willpower, and also differentiating between what is authenticity and originality. We should be conscious of the immateriality of art today, as well as the superiority of ideas and the artistic intention as fundamental values (Althöfer, 1985).

Maybe we should ask ourselves if we want to preserve the archaeological relic of contemporary art, preserving the matter or if we want to keep it alive. If restoration consists on preserving the authenticity of art, our mission is to recuperate the intention with which it was created, that is, the will to produce in us experiences, emotions, and ultimately, the desire to makes us feel more alive!

*Corresponding author: C. Santabárbara carlotasantabarbara@gmail.com

IDENTIFICATION OF SPANISH SILK FABRIC IN RELIGIOUS COLLECTIONS OF MINAS GERAIS STATE, BRAZIL

Santos, A.F.B.[1]; Coppola, S.A.A.[2]; Cosa, A.V.[3]; Mendes, I.C.[3]

[1] School of Engineering and Architecture, Mining Foundation for Education and Culture, FUMEC University, Minas Gerais, Brazil, [2] School of Fine Arts, Federal University of Minas Gerais, UFMG, Brazil, [3] Department of Chemistry - ICEx, Federal University of Minas Gerais, UFMG, Brazil

Created in 1748, the Archdiocese of the city of Mariana, Minas Gerais still conserves in its estate, an important collection of textile objects, garments and fabrics original from parishes of the State of Minas Gerais and collection considered at the time as one of the largest ornamental treasures of the church. The Inventory of Mariana Cathedral Factory from 1749 to 1904 describes, precisely, a number of whole sets of canonicals in wrought silk, received from Lisbon. Most of these pieces indicates in its ornamental composition, formal elements that make it possible to establish analogies with the textiles produced in Spanish factories of the late 17th and 18th century. Although confirmed the Portuguese origin of most of these textile objects, scientific studies in the collection pieces were essential to prove, along with formal and ornamental analyzes, the Spanish origin of the vast majority.

One of the most important series of textiles integrating the collection of the Archdiocesan Museum of Sacred Art of Mariana consists of seven pieces in red silk damask, brocade with gold metallic thread. Identically manufactured fabric was identified in the Ancient Art Museum collection in Lisbon, where it was recognized as "wrought fabric Madrid". Formally this fabric features decorative motifs in gilded weave, representing phytomorphic and zoomorphic figures arranged on a large patterned damask background. These decorative motifs commonly used since antiquity are present in the ornamentation of textiles identified as Spanish origin.

Thus, this study aims to identify the materials and textile techniques used in the production of fabric, such as the category of the fiber, the dye, the mordant and the metallic threads used. With that in mind, non-invasiveness measurements with X-ray fluorescence and UV-VIS portable spectrometers were taken to determine dyes and mordents. Fabric samples were collected using sterile scalpel and analyses by optical and scanning electron microscopy were performed to characterize the metallic threads and fiber. We seek with these procedures establish elements that confirm the origins of the Archdiocesan collection.

Figure 1: Piece in red silk damask, brocade with gold metallic thread. Museum of Sacred Art of Mariana, Minas Gerais, Brazil. Inventory IPHAN number: MG-05.157.580
Photo Claudio Nadalin

* Corresponding author: A.F.B.D. Santos afbs25@hotmail.com

MICRO AND NANOMATERIALS FOR BIO-CLEANSING OF SURFACES

Scarpa, I.*; Benedetti, A.; Riello, P.; Storaro, L.

Dipartimento di Scienze Molecolari e Nanosistemi, Università Ca' Foscari Venezia, INSTM Venice Research Unit, Mestre Venezia, Italy

The goal of this work was to develop a product easy to use, safe for the operator health, economical, environmentally friendly, efficient in short times, safe for the integrity of the artifact, re-usable, for the bio-cleansing of biological patinas from surfaces of various nature. Thanks to two thesis and a subsequent collaboration with the Ca' Foscari University of Venice, it was possible to develop and design an innovative product, protected from the request of an Italian Patent (2015) for the bio-cleansing of any type of surface. In recent years were introduced microstructured matrices and nanomaterials for Restoration and Conservation of Cultural Heritage, in particular for the consolidation and protection. The use of this type of materials confers antibacterial and repellent properties, versatility and ability to absorb ultraviolet radiation. Furthermore the use of micro- and nanomaterials makes cheaper the restoration of artifacts, and they do not degrade rapidly such as in the case of the most used products, according to Giorgi et al. (2010). However it can be said that are not known, in the state of art , products with characteristics similar to those of the product subject of this work for the bio-cleansing of Cultural Heritage surfaces.

The product consist on microstructured matrices modified in a suitable manner to host organic molecules and protein, and it can assume a gel (NasierGel) or a tissue (NasierTex) formulation. This system is designed for the removal of biological patinas, formed thanks to the engraftment of microorganisms on the surface of Cultural Heritage, such as stone, paintings, manuscripts and wood. For this purpose, as a result of preliminary laboratory tests to optimize the application procedure, the method was tested on two artifacts from the Baths of Caracalla in Rome. Furthermore a first trial quantity, equal to one kg of the gel form, was tested by a known company construction, working with the Superintendent of the place, with amazing results, which confirm the easy way to Nasier products.

Nasier products can remove biological patinas in less than a hour application. They can be used together or separately without leaving organics residues and without affecting the underlying surface, even in depth. Compared to the most common biological methods the use of Nasier formulations provides greater effectiveness thanks of microstructured matrices, which potentiate the activity of suitable grafted biological molecules, obtaining excellent results in shorter times of application.

Request of Italian Patent (August 2015), Number 102015000047115, Italian Patent Office, Padua.
Giorgi, R.; Ambrosi, M., Toccafondi, N. 2010. Nanoparticles for Cultural Heritage: Calcium and Barium Hydroxide Nanoparticles for Wall Paintings Consolidation. Chemistry-A European Journal 16, 9374-9382.

* Corresponding author: I. Scarpa irenescarpa87@gmail.com

HISTORICAL REVIEW, ARCHITECTURAL STUDIES, AND DIAGNOSIS FOR THE CONSERVATION AND RESTORATION OF THE FORTIFIED SETTLEMENT OF CARTAGENA DE INDIAS (COLOMBIA)

Scavone, M.[1*]; Masini, N.[1,3]; Sileo, M.[1]; Pecci, A.[1]; Alvarez Carrascal, J.L.[2]; Guida, A.[3]

[1] National Research Council - Institute for Archaeological and Monumental Heritage, Tito Scalo, Potenza, Italy, [2] University of Cartagena, Colombia, [3] University of Basilicata, Department of European and Mediterranean Cultures, Environment and Cultural Heritage, Matera, Italy

In the framework of Bilateral project between CNR-IBAM and University of Cartagena funded by the Programme CNR-ACAC some scientific cooperation activities have been performed in order to exchange approaches, methods and experiences in the field of the history of architecture and diagnostics for conservation of modern fortified architecture with particular reference to castles and city walls dating back to the 16th-17th century in Colombia and in Southern Italy.

Firstly, it is necessary to point out that the study is carried out on the Walled City of Cartagena that with 13 km of centuries-old colonial stone walls, towers and fortresses was selected in 1984 by UNESCO as significant to the heritage of the world, having one of the most extensive and complete systems of military fortifications in South America.

The main activities envisaged in the project are divided into different phases, including preliminary studies (historical review and typological research), architectural survey (metric surveys, general architectural and details survey, photographic survey), diagnosis (pathological study, constructive exploration and analysis of the decay), and restoration project (implementation of protection, conservation, and maintenance).

So the methodological process involved the study of previous actions and the morphological and structural analysis in order to develop interpretive models able to connect thematic and geometric information to the history of the monuments by reading and recognizing the constructive technologies and materials.

The paper focuses on the stratigraphic analysis and crack pattern surveys carried out on the walled cordon. Non-invasive surveys were carried out in situ and by visual inspection, by a disease registry, and by some tests that allowed us to detect the pathologies that significantly affect the walled cordon.

This project seeks to outline the conditions of the walled City and define some types of corrective treatment in order to improve the appearance and integrity of the walled cordon and thus ensure their protection, so that everyone continue to enjoy this cultural heritage.

* Corresponding author: M. Scavone m.scavone@ibam.cnr.it

METAL THREADS IN 11TH-15TH CENTURY SPANISH AND ITALIAN TEXTILES: METHODOLOGICAL APPROACH FOR THE INVESTIGATION OF MATERIALS AND MANUFACTURING TECHNIQUES

Scibè, C.*

Faculty of Fine Arts, University of Seville, Seville, Spain

The study and analytical investigation of metal threads started around 1970, although, the use of precious metals for the decoration of luxury fabrics goes back to ancient times.
To date, several studies have been conducted focusing on the origin, types and manufacturing techniques of metal threads used for the decoration of medieval textiles. However, the available analytical data are not enough to have an extensive knowledge of their manufacturing technology.

Through the study of metal threads, it is possible to reconstruct an important aspect of the textile handicraft, trade routes and economy of different historical cultures, due to the close connection between the use of materials and techniques and a specific period of time and textile center. Furthermore, many historical textiles show particular problems concerning the attribution usually based on historical and iconographical studies. In this connection, the investigation of metal threads technology along with the study of fibers and dyes, and weaving techniques, could contribute to classify those textiles of uncertain date and provenance.

The present contribution is a part of the author's PhD research project began in 2014 and still a work in progress, focusing on the scientific investigation of materials and manufacturing techniques of metal threads used in Hispano-Islamic, Sicilian and Lucchese textiles dated between the 11th and 15th centuries.

In this presentation, the author will briefly introduce the variety and complexity of metal threads types employed in Spanish and Italian textiles, as well as propose a methodological approach for the technical and analytical characterization of these metal threads.

In order to find the most efficient and less-destructive scientific methods, the discussion will also include the advantages and limitations of the traditional analytical techniques (as optical microscopy and SEM-EDS analysis), and the new methods recently applied to the study of metal threads (as IBA techniques, chromatographic techniques and proteomics analysis, among others).

The expected results, by the end of the project, could contribute to get a better understanding of metal threads technology and a clearer differentiation of those textiles that show problems of attribution, as many medieval Spanish and Italian ones.

* Corresponding author: C. Scibè cristinas85@alice.it

MONUMENTAL MEMORIALS

Seyidehmedli, G.*

Azerbaijan National Academy of Sciences, Institute of Architecture and Art Baku, Azerbaijan

Being one of the core and ancient types of fine art, sculpture is widely spread in the human life and plays an important role in the formation of such necessary concepts as taste and beauty. Sculpture is the art field based on the principle of capacious and physically three-dimensional representation of object. The position, motion, exterior effect of volume and weight of figure in the outside world, the ratio of the light and shade, size, rhythm, silhouette and etc are the means of artistic expression.

Monumental sculpture is one of the branches of sculpture art. The main aspects of sculpture art are the large-sized scale, the unity of volume, harmony within the environment and architecture. The main object of its establishment was conserved to the large audience. This type of sculpture may be expressed in the form of memorial complex, relief and memorials.

In Azerbaijan monumental sculpture art began to establish and develop since 1920. Within that period “Monumental popularization” plan existing in the field of art became the basic principle of sculpture and stimulated its rapid development.

Monumental sculpture art is closely related to the problem of town-building. The installation of the statue should be related with the architecture of each field, enrich the beauty of city, district, square or street and made them look more beautiful.

Besides being reflected in the cities, monumental sculpture became the main expressive means of The Alley of Honor. Monumental memorials, which are especially reflected in full-figured statues with its magnificence and the excellence of composition, obtain a large place in the oeuvre of some sculptors. The names of famous Azerbaijan sculptors, O.Eldarov, N.Aliyev, Kh.Ahmadov, F.Salayev, M.Rzayeva are especially emphasized in this list.

Among the sculptures created during the Period of Independence by the artists mentioned above, who worked in style of realism and academism the memorial monuments dedicated to the outstanding names of Azerbaijan are of particular importance.

* Corresponding author: G. Seyidehmedli gseyidehmedli@gmail.com

THE IMPORTANCE OF LANGUAGE IN THE HOLY QUR'AN AS A LINGUISTIC HERITAGE

Shahiditabar, M.[1]; Mousavi, S.M.[2]; Dehchali, A.[3]*

[1] Department of Foreign Languages, Imam Sadiq University, Tehran, Iran, [2] Faculty of Islamic Studies, Culture and Communication, Imam Sadiq University, Tehran, Iran, [3]Faculty of Islamic Studies and Political Science, Imam Sadiq University, Tehran, Iran

According to Muslims, the Holy Qur'an is the main religious text of Islam which was verbally revealed to Muhammad Prophet (P. B. U. H.) through Jibril. It is the richest source of Islamic heritage. One of the significant parts the Holy Qur'an is its linguistic heritage. This paper strives to report the importance of Language (human ability to acquire and use complex system of communication) in the Holy Qur'an. A content-based analysis approach is used as the main tool of data collection and analysis. To achieve this goal, complete text of the Holy Qur'an is studied to extract the related verses (ayahs). Then, a detailed explanation is given to show the significance of Language based on the Islamic religious text. The results of the related verses (ayahs) show that 1. Islamic linguistic heritage is not limited to just one language despite the fact that Qur'an is written in Arabic, 2. God has promised to save his heritage, 3. Various languages are resources of motives to encourage Muslims to know other better, 4. Languages are the singes of God and 5. Qur'an has i'jaz or inimitability in both form and content.

* Corresponding author: A. Dehchali alidehchali1372@gmail.com

SOCIAL AND CULTURAL IMPACTS OF CULTURAL HERITAGE BASED ON THE QUR'ANIC VIEWPOINT

Shahiditabar, M.[1]; Dehchali, A.[2]; Husseini, S.M.[2]; Mousavi, S.M.[3*]

[1] Department of Foreign Languages, Imam Sadiq University, Tehran, Iran, [2] Faculty of Islamic Studies and Political Science, Imam Sadiq University, Tehran, Iran, [3] Islamic Dawah Studies Association, Imam Sadiq University, Tehran, Iran

The importance of the conservation and valorization of cultural heritage is nothing new and it is clearly understood worldwide. However, different cultures and traditions may each have their own distinctive reasons and views regarding the significance and impact of cultural heritage. Understanding these different worldviews and resulting motives behind cultural heritage conservation and promotion will not only improve international cooperation on the subject but can also inspire new ways to appreciate and view cultural heritage.

We believe that the Muslim book of religion, the Qur'an, inspires a unique and thought-provoking vision regarding cultural heritage and its social and cultural impacts. Our study on the subject involves a number of phases. We have first studied and categorized the different verses in the Qur'an to bring forth the different arguments raised in the Qur'an for the importance of cultural heritage and its impact; arguments such as those that demand for the study of what remains from previous peoples and the need to understand other cultures and nations as a form of worship "Ibadah".

In the next phase we examine how the Qur'anic view has impacted the way a Muslim sees and interacts with cultural heritage, illustrated with literary and historic examples from the Islamic world.

To better demonstrate how cultural heritage has impacted the Islamic world, we will explain how the Qur'anic view regarding cultural heritage has influenced two of the most important Islamic ritual gatherings, the Hajj being centered on the historic Ka'ba, and the mourning procession on the 8th day of Muharram in Zanjan.

* Corresponding author: S.M. Mousavi sayedm@isu.ac.ir

THE IMPORTANCE OF CULTURAL HERITAGE IN ISLAMIC LIFESTYLE

Shahiditabar, M.[1]; Mousavi, S.M.[2]; Dehchali, A.[3]*

[1] Department of Foreign Languages, Imam Sadiq University, Tehran, Iran, [2] Faculty of Islamic Studies, Culture and Communication, Imam Sadiq University, Tehran, Iran, [3] Faculty of Islamic Studies and Political Science, Imam Sadiq University, Tehran, Iran

Religion is an inseparable part of both cultures and heritages. So, religions like Christianity and Judaism and Islam can have their hands to keep cultural heritages alive or cause their death. They make unique motivations for their followers to do anything like safeguarding their own cultural heritage. This paper is aimed to show the excellent experience of Islamic system to make a bilateral relationship between Muslims and their cultural heritage. According to Islamic teachings, heritages are not just some resources of money, moreover, they play a crucial role in:
a) Human's life,
b) Reminding God,
And
c) What should be understood from nation's histories.

So, Muslims should call all their hands to safeguard these significant parts of Islamic lifestyle. According to the current study, this mutual cooperation between Muslims and the worldwide cultural heritage has been built through Islamic principles like Zekr and Ebrat.

Zekr, has different meanings in Quran like "Bible" and "Quran" itself and "remembrance". But Quran uses another meaning of Zekr in conjunction with cultural heritages which is preachment. Zekr means to keep right life lessons and beliefs in your heart. (Al-Mufradat fi Gharib al-Quran) So Muslims will keep shiny points of history in their mind because of cultural heritage preachments.

Ebrat, basically means to have transition from one point to a deeper one(Al-Mufradat fi Gharib al-Quran) and it is important to notice that Ebrat is not just a moral lesson for Muslims, it can be economic and political or related to Architecture etc. Quran sees cultural heritage as a bridge that transfers Muslims from its outside to inside and it is what Quran calls Ebrat.

This study proves that what makes it easy to give Muslims Zekr and Ebrat is their cultural heritage so they have an unforgettable impact on Muslim's lifestyle.

* Corresponding author: A.Dehchali alidehchali1372@gmail.com

A PROBE INTO CULTURAL HERITAGE VERSUS MODERN TERRORISM

Shahiditabar, M.[1]; Mohseni, M.[2*]; Babaii, A.[3]

[1] Department of Foreign Languages, Imam Sadiq University (ISU), Tehran, Iran, [2]Faculty of Islamic Studies, Theology and Guidance, Imam Sadiq University (ISU), Tehran, Iran, [3] Faculty of Islamic Studies and Political Science, Imam Sadiq University (ISU), Tehran, Iran

Modern terrorism is defined as using violence to establish a fundamental state. They utilize religion and its credos and principles as a means for their goals.

This paper tries to raise the question on how the present days terrorism destroys historical-cultural heritage of Syria as a global cultural heritage and seeks to find the roles and goals of terrorists in ruining and demolishing these international heritages during “2014-2016”.

Intent to destroy and despoil the cultural heritage has been conducted by ISIS since 2014 in Syria. For example ISIS destroyed buildings include the minaret of the Great Mosque of Aleppo and the Al-Madina. Irena Bokova, the director-general of UNESCO requested publicly for the safeguarding of Syria's cultural heritage and announced it as "grave concern about possible damage to precious sites’’ On 30 March 2012. The Islamic State destroyed the Lion of Al-lāt, the temples of Bel and Baalshamin, the Arch of Triumph and other sites in Palmyra. The group also destroyed the Monastery of St. Elian, the Armenian Genocide Memorial Church, and several ancient sculptures in the city of Ar-Raqqah.

Since terrorists have introduced themselves as Muslim, why they destroyed and are still destroying the ancient relics in Syria as an Islamic country?

Mosque is the main symbol of Islamic cultural heritage and obviously it has been known as worldwide architecture heritage. Forasmuch as terrorists claim that they are original Muslims and obey Islamic ideology as real theist, they deliberate to ruin these valuable heritages. It is a clear inconsistency belief and behavior. What are the benefits of destroying mosques which are recognized as humanity capital?

The current study is going to expose these unusual gestures and manners of terrorists.
How is the vision of Islam into the cultural heritage?

What is Islam’s approach and perspective into this disaster (destroying of Syria cultural heritage)? And Does Islam confirm these terrorist treatments?

To answer the proposed research questions, Syria history (particular ancient relics) and Islamic ideology (based on the Quran) are studied meticulously.

* Corresponding author: M. Mohsen Isenkgn@yahoo.com

DETERIORATION ASSESSMENT OF THREE TYPES OF LIMESTONES FROM PASARGADAE WORLD HERITAGE SITE IN IRAN

Shekofteh, A.[1]*; Molina Piernas, E.[2]; Arizzi, A.[2]; Cultrone, G.[2]; Ahmadi, H.[1]; Yazdi, M.[3]

[1] *Art University of Isfahan, Faculty of Conservation, Isfahan, Iran,* [2] *University of Granada, Faculty of Science, Department of Mineralogy and Petrology, Granada, Spain,* [3] *University of Isfahan, Faculty of Science, Geology Department, Isfahan, Iran*

Pasargadae is an archaeological site from Achaemenid period (550 BC) which is one of Iran's UNESCO World Heritage Sites. It included: mausoleum of Cyrus the Great, two royal palaces, fortress and the remains of a temple. Three different types of limestones are distinguished on the basis of their color: beige, green-gray, and dark-gray. In naked eyes, different decay patterns can be observed such as scaling, exfoliation, and peeling. The documentation of different decay patterns were carried out by photography. Some small samples were collected from detachment parts of Cyrus tomb. Two samples were taken from the surface of Toll-e Takht and "winged figure" seemed to be covered by patina layer. Also, some other samples were collected from the rest of monuments.

In order to identify the deterioration patterns and the probable sources of agents responsible of stone decay, some microstructural studies, as well as element analysis have been carried out by ESEM-EDX. According to analysis some dissolution and recrystallization processes were observed in beige stone. Also, some dividing bacterial cells were visible as well as the presence of pitting caused by the penetration of fungi hyphae into the stone. In green gray stone, sugaring pattern, dissolution holes and channels were observed and in dark gray stone the presence of secondary calcite and clay minerals were obvious. It was interesting to observe; a soft layer that coated the surface of the beige stones. In appearance, these layers seem to be a reddish patina, but EDX analysis of one of the two patina samples indicated the presence of Ca, Mg, Si, Fe and other soil elements such as Al and K. The analysis of a second patina is different even their appearances are similar; it is rich in Ca, Si and P. Because of the inexistence of salt crystals in ESEM images, XRD analyses were carried out on the samples collected from scaling surfaces, but the diffractograms not showed the presence of salt phases.

In conclusion, decay patterns of beige stone include pitting, scaling, calcite dehydration and recrystallization caused by the growth of lichen. Samples with patina layers are different in compositions and their presence could be related, in one case, to the development of an oxalate patina or calcium carbonate, and the other patina samples, to calcium phosphate induce by organic precipitation. The green-gray stone is composed of different particles such as calcite and quartz and the main problems are heterogeneity in mineralogy and calcite dissolution. In dark-gray stone, the main decay phenomenon is exfoliation, probably related to the presence of clay minerals, which can suffer swelling.

* Corresponding author: A. Shekofteh shekofte.as@gmail.com

NEUTRON RADIOGRAPHY AS A TOOL FOR MONITORING THE EFFECTIVENESS OF CONSOLIDANT NANOMATERIALS APPLIED TO THE STONE HERITAGE

Sierra-Fernández, A.[1,2*]; Gomez-Villalba[1]; L.S; Rabanal, M.E.[2]; Fort, R.[1]

[1] Geosciences Institute IGEO (CSIC-UCM), Madrid, Spain, [2] Carlos III University of Madrid and IAAB, Department of Materials Science and Engineering and Chemical Engineering, Madrid, Spain

The development of nanomaterials for the consolidation of stone heritage is crucial for the conservation science. The knowledge of the penetration depth of the consolidant product and its distribution into the stone matrix determine the treatment effectiveness. However, most of the techniques used for evaluating the penetration of consolidant products are destructive in nature, such as staining techniques or micro-drilling. The analyses of art works that constitute our cultural heritage require non-destructive and non-invasive approaches and analytical tools due to the high cultural values. Therefore, during last years, the possibility of monitoring the consolidant action in natural stone by means of neutron and X-rays radiography has been introduced (E.H. Lehmann et al. 2001). Due to its high sensitive toward hydrogen the advantage of neutron radiography is in possibility to visualize materials which can be hardly distinguished with other non-destructive techniques such as x-rays, nuclear magnetic resonance or ultrasound. Thus, this study is based on the effectiveness and stability research of a new consolidant product based on $Mg(OH)_2$ nanoparticles designs in order to protect the calcium-magnesium substrates (Sierra-Fernández et al. 2014). The nanomaterial has been applied in dolostone specimens both by brushing and capillary absorption and the penetration depth and its distribution into the stone has been monitored by neutron radiography. The results showed that the nanomaterial can easily penetrate into the stone. However, at the drying phase the application method had important implication for the migration of the nanomaterials, reaching a maximum particle penetration of 1.52 cm in the dolostone treated by capillary absorption. Neutron radiography has proved to be an excellent tool to monitor clearly the $Mg(OH)_2$ nanoparticles solution content in porous carbonate stone non-destructively with good spatial and time resolution.

Research funded by Geomaterials 2 (S2013/MIT_2914) Programme.

Lehmann, E.H., Vontobel, P., Wiezel, L. 2001. Properties of the radiography facility Neutra at SINQ and its potential for use as european reference facility, Nondestructive Testing and Evaluation, 16:2-6: 191-202.

Sierra-Fernandez, A., Gomez-Villalba, L.S., Rabanal, M.E, Fort, R. 2014. New consolidant product based on nanoparticles to preserve the dolomitic stone heritage. Science, Technology and Cultural Heritage, 139.

* Corresponding author: A. Sierra-Fernández arsierra@ucm.es, a.sierra@igeo.ucm-csic.es

ANTIFUNGAL PROPERTIES OF MgO, ZnO AND Mg/Zn OXIDE NANOPARTICLES FOR THE PROTECTION OF STONE HERITAGE

Sierra-Fernández, A.[1,2*]; De la Rosa-García, S.C. [3]; Gomez-Villalba, L.S. [1]; Rabanal, M.E. [2]; Quintana, P. [4]; Fort, R.[1]

[1] Geosciences Institute IGEO (CSIC-UCM), Madrid, Spain, [2] Carlos III University of Madrid, Department of Materials Science and Engineering and Chemical Engineering and IAAB, Madrid, Spain, [3] División de Ciencias Biológicas, Universidad Juárez Autónoma de Tabasco (UJAT), Tabasco, México, [4] Departamento de Física Aplicada, CINVESTAV-IPN, A.P.73, Cordemex, Mérida, Yucatán, México

The growth of a wide variety of microorganisms on stone substrates is considered one of the main degradation processes of stone heritage. These microbial agents can deteriorate stone, generating acidolytic and oxido-reductive corrosion in stone minerals. In this context, metal nanoparticles might be an effective tool for controlling the biodeterioration because present great advantages (high surface to volume ratio and small particle size). Among all of them, magnesium and zinc oxides are particularly interesting as low cost and environmental friendly materials, with interesting antimicrobial activity without the presence of light. In this way, in order to obtain nanoparticles with high antifungal activity, controlled MgO, ZnO and Zn-doped MgO (Mg1−*x*Zn*x*O) nanoparticles (NPs) were synthesized via sol-gel method. The nanoparticles were firstly studied by Field Emission Scanning Electron Microscopy (FESEM), Transmission Electron Microscopy (TEM) and X-rays Diffraction (XRD), and then the antifungal activity of the single and Zn-doped magnesium oxide nanoparticles were studied against *Aspergillus niger* (TM3H174) and *Penicilium oxalicum* (TM3H776), which are especially active in deterioration of stone heritage. The experimental results showed the successful use of the sol-gel synthesis route to obtain crystalline MgO, ZnO and Zn-doped MgO nanostructures with potential properties for the conservation of the stone heritage. The MgO and Zn-doped MgO nanoparticles displayed the best antifungal activity against *A. niger* and *P. oxalicum* fungus. The successful antifungal properties observed suggest the utilization of prepared nanoparticles as a potential novel antifungal agent in stone-built cultural heritage.

Research funded by Geomaterials 2 (S2013/MIT_2914) Programme.

* Corresponding author: A. Sierra-Fernández arsierra@ucm.es; a.sierra@igeo.ucm-csic.es

DIAGNOSTICS FOR THE CONSERVATION OF FRESCOES IN POMPEII. PRELIMINARY RESULTS FROM GPR AND IRT INVESTIGATIONS

Sileo, M.[1*]; Masini, N.[1,2]; Geraldi, E.[1]; Leucci, G.[1]; Montano, V.[3]

[1] Institute of Archaeological and Monumental Heritage, National Research Council (CNR), Potenza,Italy, [2] University of Basilicata, DICEM, Matera, Italy, [3] SAMOA srl, Colle Umberto TV, Italy

Monitoring of state of conservation of monuments and works of art is provides the information basis for any restoration interventions and conservation treatments. In particular for the monitoring of wall paintings it is mandatory the use of non invasive sensing technologies with portable instruments. Some of them are mainly focused on the analysis of pictorial layer, such as XRD (X-ray diffraction), XRF (X-ray fluorescence), hyperspectral imaging. Other are applied for the evaluation of the state of conservation of the plaster coats on which paintings are executed with fresco or secco technique. The first is a painting technique water-based pigments on freshly applied plaster. The second, known also as lime painting, the plastered surface of a wall is soaked with slaked lime. The colours do not penetrate into the plaster but form a surface film.

In roman times frescoes were all commonly used by the 1st century BCE for decorating walls and ceiling of private homes, public buildings and temples. They were made in different phases, each of them costining of the application of a coat of plaster as described by Vitruvius and Pliny the Elder. Generally, one rough coat of mortar composed of lime and sand (or volcanic pozzolana, as in the case of Pompeii and Hercolaneum) was applied directly of the wall surface. Then, two or more fine coats, using lime and fine crushed marble or compact stones, were added to gibe a smoother finish of the surface, still wet, on which the artist painted. Each coat had a different grain size of the mortar; therefore possible detachment can occur over time, especially if damaged by high temperatures as in the case of Pompeii. The paper show some preliminary results of diagnostics investigations performed on two frescoed walls inside the Domus of the Silver Wedding in Pompeii.

Diagnostics for conservation, although is widely considered an essential tool for knowledge, however, is still struggling to establish itself in the operational practice. This is due to several reasons, including the costs still high, the difficulty of processing and interpretation of the acquired data, the lack of recognized operating protocols, especially in those cases where the aim is to study and investigate both material decay and structural instability problems, as in the case of of Domus of the Silver Wedding. Here in the weathering and the presence of heavy and rigid concrete structures have caused also some static problems on the masonry structure. The goal has been to get a diagnosis on material decay and structural problems, as well as to investigate the presence of detachment and discontinuity on frescoed walls and locate the injection of cement operations carried out in the previous restorations. For this purpose a multi-sensor approach based on the use of a number of non-invasive tests in situ, including ground-penetrating radar and infrared thermography, was adopted to collect useful information for the understanding and evaluate of the conservation status. The article discusses the methodological approach and the results of surveys which put in evidence the great effectiveness of the adopted approach.

* Corresponding author: M. Sileo m.sileo@ibam.cnr.it

MULTISCALE AND MULTI-SENSOR MONITORING OF CULTURAL HERITAGE: A CASE STUDY IN BASILICATA REGION (SOUTHERN ITALY)

Sileo, M.[1*]; Masini, N.[1]; Gizzi, F.T.[1]; Donvito, A.[2]; D'Andrea, L.[2]; Lasaponara, R. [3]

[1] CNR-IBAM (Istituto per i Beni Archeologici e Monumentali),Tito (Z), Italy, [2] Digimat System Engineering, Matera, Italy, [3] CNR- IMAA, Tito (PZ), Italy

The conservation of cultural heritage requires a systematic, innovative, economically-sustainable and long-lasting monitoring as historical sites are threatened both by natural hazards and human factors. Therefore, monitoring of cultural heritage in recent years is involving more and more new technologies and approaches that involves full-scale analyses of the historical site, from the macroscale to the microscale.

The Macro scale approach looks at analyzing the natural and man-made processes considering the whole environment/territory where the cultural heritage is localized: this can be made through satellite or aerial earth observation technologies The mesoscale studies include the spatial and temporal change of parameters in small portions of territory, for example a historic building complex which has been degraded over the years as a result of the interaction between building material and the natural environment. The microscale monitoring looks at the specific object to be preserved contained in a specific building, cave or part of it, object in danger due to temperature and humidity changes, presence of water and problems related to a non-adequate control of the use of such cultural containers.

The aim of the paper is to define a methodological approach useful to analyze at different scales the variables responsible for the changes of the state of conservation of cultural heritage.

This project sets out to analyze the long-term ones that are the daily changes, seasonal and annual parameters involved in determining the evolution of the state of conservation of the monuments, from individual building container of cultural property to the control and monitoring of the entire territory in which the cultural heritage is included. For this reason, the site chosen for the trial of our approach is in Matera, which is part of UNESCO World Heritage list. The goal is to create an innovative monitoring from macro to micro scale to assess what are the parametric incurred in the state of conservation of this site and to predict what will be the possible changes that will result with the expected increase in visitors in the coming years.

* Corresponding author: M. Sileo m.sileo@ibam.cnr.it

POLYCHROME PLASTERWORKS: ARCHITECTURAL INTENTION AND RESTORATION

Sola Alonso, J.R.*

ETS of Architecture, Universidad de Valladolid, Valladolid, Spain

The architectural decision of a given material must be able to transmit not only its physical quality, but also its architectural intention. This was the approach developed in the research of a chapel in the Peregrina´s church (Sahagún, León, Spain), a 13th century Franciscan temple built by the Moorish culture (It was declared a Property of Cultural Interest in 1931), during the end of its restoration. Inside the chapel the polychrome plaster-works (s. XV) stands out, carved in plaster and facing east and south, this were able to express a powerful architectural idea with the help of light. This natural quality was skillfully completed by other decisions that are distinguished in the perception of a spectator in motion.

The goal of the proposed intervention was the recovery of architectural perception of plasterwork as a surrounding of an unitary space (proportions, light access and directionality) by means of two main actions.

Firstly, a superficial treatment with lime mortar on all walls was carried out. With this action, the plasterwork recovered its prominence in the chapel, not only in the color that its polychrome provides (red, orange, indigo, green, blue, pink, black), but also in the vibration that is produced by their carved decoration on geometric figures (based in radiant star motifs - 8 and 16 pointed stars, an epigraphic band on them, poly-lobed arches, Arabic vegetable decorations, rosettes etc.). Secondly, the action on the plasterworks consisted principally in actions of conservation that respected scrupulously the basic principles of legibility, reversibility, compatibility and minimal intervention. On the whole, interventions on the plasterworks can be removed, no aesthetic damages have been caused and with the development of the discipline, physical or chemical incompatibility between these different materials has been avoided.

The construction technique that shaped the plasterwoks, was intimately tied to its creative purpose. The dialogue between the work of the master builder and the plaster became the instrument of a clear expressive purpose, highlighting the intrinsic and extrinsic qualities of the mineral material. For this reason the restoration of the polychrome plaster-works was not only intended for the recovery of the material, not even because of the way it was recreated, but also for its genuine architectural expression.

Figure 1. Chapel before intervention

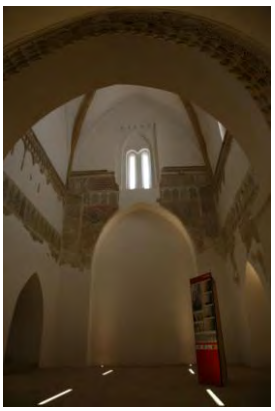


Figure 2. Chapel after intervention

* Corresponding author: J.R. Sola Alonso j.ramonsola@gmail.com

GEOPOLYMERS: INNOVATIVE MATERIALS FOR CONSERVATION WORKS

Soragni, E.[1,2*]; Gualtieri, S.[1]; Bernardi, E.[2]

[1] National Research Council of Italy, Institute of Science and Technology for Ceramics (CNR-ISTEC), Faenza, Italy, [2] University of Bologna, Bologna, Italy

In restoration works it is important to use products that are compatible with materials composing the Cultural Heritage artworks.

The majority of these products (ceramics, mosaics, mortars, stones) are made of natural inorganic raw materials. In the conservative interventions of Cultural Heritage artworks is important to use inorganic compounds that have chemical composition, microstructure and porosity similar to the original materials.

For these reasons, we are setting up geopolymers that simulate natural porous materials. Geopolymers are artificial inorganic polymers synthesized by alkali activation of materials rich in SiO_2 and Al_2O_3 (e.g. metacaolin, fly ashes, natural minerals, blast-furnace slags).
The main characteristics of geopolymeric binder are based on some important ratios: Si/Al; alkalis/Al_2O_3 and H_2O/alkalis (Davidovits 2008). The reaction, called geosynthesis or geopolymerization, takes place at low temperature (<300°C).

The binder, similar in aspect to the injection mortar, could be used alone, but the physical and mechanical properties can be improved adding different types of aggregates, fillers, inorganic pigments, organic dyes and additives.

The main characteristic of geopolymers is the possibility to tailor them according to their final application.

In the restoration and preservation field, geopolymers can be used to replace pieces, to make copies but also to manufacture new artistic objects.
At present, we deal with the production of lightweight movable panels as support for mosaics and wall paintings fragments, the production of colored geopolymers to be used as mosaic tesserae for integration works and the manufacture of masterpieces, copies and new artistic objects.

All the products obtained were characterized by means of mechanical tests and from microstructural point of view (such as observations at electron microscope, porosimetric analyses, etc ..). In addition, release of soluble salts and colorimetric analyses were investigated in order to know the behavior of the materials exposed to chemical stresses and different environmental conditions.

Results of the mechanical tests carried out on geopolymeric composites are positive (compressive strength=50 MPa; flexural strength=10 MPa) and comparable to those of commercial products. No significant changes in the speciation and the concentration of released ions suggest a good stability of geopolymers in basic and acid environments.

J. Davidovits, "Geopolymer Chemistry and Applications", 2008, Geopolymer Institute, Saint Quentin, France.

* Corresponding author: E. Soragni elena.soragni@istec.cnr.it

THE MUSEUM OF AMERICA IN MADRID: A PROBLEMATIC COLONIAL HERITAGE IN POSTCOLONIAL TIMES

Souto Martín, M.[1]; Palacios González, D.[2*]

[1] Universidad Autónoma de Madrid, Madrid, Spain, [2] Universidad de Oriente, Santiago de Cuba, Cuba.

The present conference proposes a critical approach to the Spanish colonial heritage through the case of the Museum of America in Madrid. It presents a collection of ethnography from pre-Columbian cultures as well as from the colonial period that proceed mainly from XVIII century scientific expeditions and XIX acquisitions, not being a museum that hosts the heritage despoiled during the early colonial times or heritage from American countries after their independence. These makes the museum a problematic case where the colonial heritage is built through a collection with a late origin that was the pillar for a Museum built years after the independences trying to recuperate the history of the colonial period in postcolonial times.

Taking as conceptual framework the notion of transculturation, as strategy of construction of the national identity through the colonial history that implies the appropriation of the colonized culture, and the notion of the museum of ethnology as space for the encounter with other cultures with a common history that hides past and present power relationships, the Museum of America is presented as a case where the ethnological approach to the American heritage in Spain hides power relationships that the Museum tries to get over with their public and educational programs. But the characteristics of the collection and their display makes them easy to misunderstand in an epoch where the post colonial studies are generalized in the main universities and centers of high studies making them objectives of hard critics, specially from Latin American researchers. The methodology followed was an empirical approach to the collection, its current display in the Museum and the public and educational programs of activities recognizing how this heritage of the colonial times is showed still from a colonial point of view where the key of the discourse is the role of Spain in the “discovery” as well as the rationalization of the pre-Columbian cultures in contrast with the new initiatives in the public programs.

During the last years the Museum has worked in the renovation of its image though initiatives such as international research conferences, activities with migrant collectives and artists, internships for young students, integration projects and scholar visits between others. Besides these initiatives the collection display continues having an canonical narrative that clash with the cultural diversity context where it is emplaced and with the academics, researchers and artists who aims to participate resignifying the Museum not regarding to its importance as heritage but looking for create a post-colonial, post-modern or de-colonial discourses, art pieces or exhibitions. It is possible conclude that to converge the characteristics of the collection, the good will from the Museum direction, the external critics and the local communities is a risky task. To manage the Museum of America and the heritage that it hosts will imply in the near future to take in account to all the actors in this problem, to ignore one of them could represent a failure but to get a consensus could be also impossible.

* Corresponding author: D. Palacios González danielpalaciosgonzalez@hotmail.es

DEVELOPMENT OF COMPATIBLE AND SUSTAINABLE RENDER SYSTEMS FOR SALT-CONTAMINATED BRICK MASONRIES

Speri, L.; Falchi, L.*; Balliana, E.; Zuena, M.; Zendri, E.

Ca' Foscari University, Venice, Italy

In presence of salty water and marine aerosol, historic brick walls are subjected to a particularly aggressive environment due to capillary rise phenomena, transport and deposition of salts that cause disaggregation, efflorescence, fractures and fissures of the surfaces. One of the possible protection measures, intensively investigated since the 1990s, is the use of render systems with suitable composition, able to adjust the water flow and the migration of salts from the substrate towards the render.

In this study, double-layer renders were formulated considering the following objectives: compatibility with ancient masonries, environmental sustainability, and effectiveness in ensuring the salt migration. Thus, natural hydraulic lime as binder (lower carbon footprint in comparison to cement) and a partial replacement of the aggregates with recycled render wastes were selected. Moreover, an air entraining agent in the inner layer and different percentages of water-repellent admixtures in the outer layer were added in order to adjust the render structure. The systems were applied on bricks and subjected to rising damp-evaporation cycles, in order to investigate their behaviour and properties in respect to water flow and salt migration.

The water vapour permeability, the capillary absorption, the drying behaviour and the compressive strength of each formulation were evaluated on mono-material render specimens according to EU standard tests.

Two layers of render with different composition were applied on bricks, cured for 28 days and subjected to drying-wetting cycles of salty water (NaCl 3%) by capillary rise. Fundamental parameters such as the adhesion of the plaster to the substrate and the resistance to the action of salts were evaluated by visual and optical microscope observations, colorimetric and sclerometric measurements. In order to assess the salt transport and distribution within each system, the salt profile was determined by conductivity measurements, whilst the disruptive effect of salts on the render microstructure was estimated by mercury intrusion porosimetry. Moreover, the renders were separated from the bricks at the end of the cycles and the water vapour permeability, the capillary absorption and drying behaviour of the double-layer systems were determined.

In the present contribution, selected results concerning the more interesting systems in relation to the salt transport behaviour will be reported. In general, different behaviours were observed: deposition of salts within the lower layer or at the lower-upper layer interface (sacrificial plaster); rapid transport of salts to the surface (fast salt-transporting permeable plasters); slow transport and permanence of salt at the brick-render interface (salt blocking renders). The first two behaviours led to positive responses with high salt transport towards the render and without render failure, and were observed whenever two layers with different microstructure and permeability properties were present. The third behaviour caused render detachment and matrix disruption.

* Corresponding author: L. Falchi laura.falchi@unive.it

RAMAN/EDX NON-INVASIVE MICROANALYSIS OF III-CENTURY STUCCOES FROM DOMUS VALERII IN ROME (ITALY)

Spizzichino, V.; Almaviva, S.; Lecci, S.; Puiu, A.*

ENEA, Italian National Agency for New Technologies, Energy and Sustainable Development, Frascati (Rome), Italy

In the framework of the COBRA project (ENEA technologies for cultural heritage, availability and perspectives for technology transfer) two III-century stucco fragments from Domus Valerii (Barbera et al 2008) in Rome (Italy) were non-destructively analyzed by micro-Raman spectroscopy and energy dispersive X-ray microanalysis (EDX) in order to determine the identities of the pigments and materials thereon.

Cinnabar, malachite and egyptian blue were detected as pigments by the synergistic use of these two techniques, whereas chalk and calcite were detected as materials for bas-relief figures. Further information and confirmation of the obtained results will be carried out by PIXE (Particle-Induced X-ray emission) and XRF (X-ray fluorescence spectroscopy) analyses in the next future. This nondestructive characterization is the first to be carried out on the Domus Valerii finds.

Figure 1 shows an image of one of the archaeological finds whereas figure 2 shows the obtained Raman spectrum for cinnabar.

Figure 1. III-century Domus Valerii stuccoes

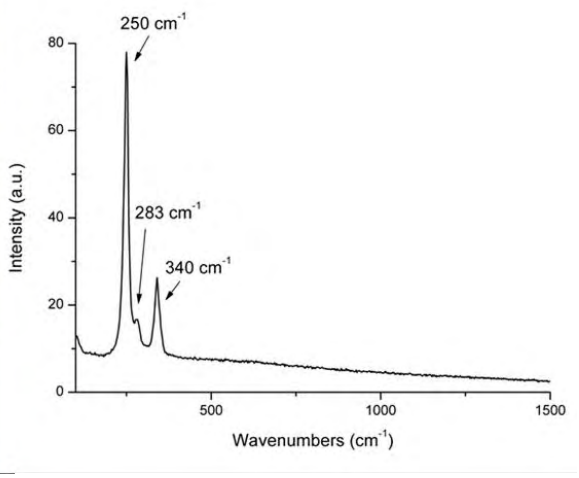


Figure 2. Raman spectrum of cinnabar

We thank Mr. Giacomo Casaril for providing the samples and for fruitful discussions in performing this research activity.

Barbera, M.; Palladino, S., Paterna, C., 2008. La domus dei Valerii sul Celio alla luce delle recenti scoperte. British School at Rome 76, 75-98.

* Corresponding author: A. Puiu adriana.puiu@enea.it

PROTECTING ADOBES BY INCREASING THEIR HYDROPHOBICITY USING ALTERNATIVE METHODS

Stefanidou, M.*; Karozou, A.; Kapsimani, M.

Laboratory of Building Materials, Civil Engineering Department, Aristotle University of Thessaloniki, Greece

Clay-based materials such as structural mortars, renders and adobes were the first construction materials. Their diachronic use rendered them as valuable part of our cultural heritage. Nowadays, there is an increasing interest in studying and protecting clay materials as they have proved to serve principles of sustainability due to their low energy consumption and their re-use properties.

The main pathology factor of clay-based materials is their contact with water as their structure is loosening and they can't take loads. In the present paper, laboratory produced adobes were protected by a alko-siloxane solution enriched with nanosilica and by an alternative solution of recycled oils. Different tests have been performed in order to test the hydrophobicity achieved such as water absorption both by Karsten tubes and under vacuum, water uptake by capillarity and drying behaviour as well as their durability after wetting-drying cycles.

It seems that the alkosiloxane solution was very effective but recycled oils, used for the first time in this application, present some interesting data which shows that this recycled and cheap material has some potentials in the field of hydrophobicity.

* Corresponding author: M. Stefanidou stefan@civil.auth.gr

NON DESTRUCTIVE TESTS (NDTs) APPLIED TO CULTURAL ASSETS

Suárez Saro, L.*

School of Art of Asturias (ESAPA), Avilés, Spain

Non-destructive tests allow us to detect discontinuities or evaluate properties of materials without altering their state and integrity. If an object is catalogued as a cultural asset and it needs to be studied in order to verify certain distinctive features, which cannot be observed by the naked eye, the use of non-destructive tests represents a very useful tool to make an evaluation, determine its state of conservation, verify possible restorations and provide information useful for a general diagnosis.

The aim of this work is to carry out a complementary study on two carvings made of polychrome wood, Saint Joseph and the Child Jesus (18th century) and Sacred Heart of Jesus (19th century), and a painting of the Sacred Family with Saint John Child (18th century) by means of different non-invasive techniques.

The following equipment, property of the Asturias Central Hospital, has been used in the execution of the Radigraphy and Scanner (TAC) tecniques:

X-ray: General Electric equipment model Discovery XR-656 with digital detector. “AP” and “Lateral” TeleX-rays.

Scanner: Somaton Definition Flahs Dual Energy equipment with 128 detectors.

The analysis interpretation has allowed us to determine which material features and techniques have been used to do artwork. Moreover, it has been possible to detect their intrinsic imperfections as well as the extension and location of the damage they have undergone throughout their history. Last of all, ancient interventions that have changed iconography have been revealed. For example, the Sagrado Corazón, as it is today, was once a callow saint and San José’s figure was added to a reliable copy of la Virgen de la tienda de Rafael.

*Corresponding author: L. Suárez Saro lsaro@telecable.es

FINANCING ITALY'S HERITAGE SITES

Suhan, A.*

University of Minnesota, Minneapolis, United States of America

With fifty World Heritage sites, Italy is fiscally responsible for more World Heritage sites than any other country in the world. Unfortunately the country has seen many years of economic uncertainty, yet the need for heritage site maintenance continues. In recent years, unique funding strategies such as fee structures, tax incentives based on visitor behavior studies, and public-private partnerships have been utilized to counteract the deteriorating culture budget and support Italy's nearly 50,000 documented architectural assets. Through case studies of tangible World Heritage Sites in Italy, the research for this paper examined ways the country has balanced this monetary responsibility through these strategies. The research focused on the public-private partnerships helping to restore the Colosseum, Rialto Bridge, and the Trevi Fountain, specifically, how these partnerships are set up as well as how they engage the public during the restoration process.

The Colosseum is an icon of Rome as well as Italy as a whole and recently received €25 million for restoration work funded by luxury leather brand Tod's through a public-private partnership. The Rialto Bridge in Venice demonstrates a partnership between clothing company Diesel and the Ministry of Cultural Heritage and Activities and Tourism (MiBACT) to work together in restoring this landmark. This project also shows the common practice of selling advertising space on the project's scaffolding to raise funds for the work. Rome's Trevi Fountain is a similar situation in which luxury clothing and accessory company Fendi is funding the project in return for advertising. It also brings up the issue of how to engage the public at the site while it is under serious renovations and the implications it can have on visitor experiences. Pompeii is also explored in contrast as it represents the complexities of protecting World Heritage sites because it has been of deep concern to the World Heritage Committee, yet continues to crumble. These projects are on-going and ever-changing, thus making them particularly relevant for the most current cases to explore.

Governmental influences in heritage preservation are also examined through the new tax incentives such as the 'Art Bonus' and fee structures that have been enacted in the past few years. In addition, not-for-profit organizations such as Fondo Ambiente Italiano's engagement as well as their transparency with the community in regards to heritage preservation are explored. While some of these strategies may be seen as a commodification of culture, they also provide much needed assistance and create a foundation for strong financial partnerships. Italy's creative financial solutions to heritage management are worthy of research in hopes that their tools can be an example for other nations facing or nearing similar economic issues.

* Corresponding author: A. Suhan suhan002@umn.edu

COMPATIBILITY OF MINERAL BASED REPAIR MORTARS WITH THE HUNGARIAN MIOCENE LIMESTONE

Szemerey-Kiss, B.*; Török, Á.

Department of Engineering Geology and Geotechnics, Budapest University of Technology and Economics, Budapest, Hungary

Behavior of three commercial available (ready-mix) repair mortars and same materials with modified composition (with 50 m% limestone aggregate) were analyzed under laboratory conditions.

Air-dry, water saturated and freeze-thaw effected samples were tested. Properties of mortars with different B/Ag (binder/aggregate) ratios and porous Miocene limestones were compared during the research. Changes in properties were evaluated on long-term. Strength of repair mortars specimens were measured on the 3, 7, 14, 28, 90, 180 and 360 days after the sample were demoulded at the second day. Limestone aggregate that had large pores surprisingly caused a shift in effective pore radii toward smaller pores when 50% limestone aggregate was added to pure mortars with one exception.

Tests results indicate that these commercially available repair mortars, even though they are suggested to be used for porous limestone, behave very differently under different conditions. Adding limestone aggregate - even up to a proportion of 50m% - does not shift properties of the mortars toward appropriate compatibility, i.e. does not increase the porosity and modify the pore-size distribution, does not modify strength in an appropriate way.

Results have proved that natural limestone has mainly medium and large pore radio (macro) while the repair mortars even with high aggregate content has predominantly smaller pores (mainly in the micro zone). These experiments have proved that additional research is needed to find the most appropriate repair mortar for porous Miocene limestone.

The financial support of OTKA post-doctoral grant to BSZK (reference number is: PD 112-955) and National Research, Development and Innovation (NKFI) Fund (ref. no. K 116532) are appreciated.

*Corresponding author: B. Szemerey-Kiss szemerey@gmail.com

EXAMINING THE IMPACT OF SOLUBLE SALTS ON DOLOMITE DETERIORATION

Tavukçuoğlu, A.[1]; Caner-Saltık, E.[1]; Güney, A.[1]; Erol, F.[2*]; Mısır, Ç.[2]; Çetin, Ö.[2]; Karahan-Dağ, F.[2]; Ataklı, Y.[2]; Çömez-Kutkan, S.[3]; Erdil, M.[1]

[1] Architecture Department Middle East Technical University, Ankara, Turkey,
[2]Archaeometry Department Middle East Technical University, Ankara, Turkey,
[3]Chemical Department Middle East Technical University, Ankara, Turkey

Salt weathering is known to be destructive to the historical buildings, which are constructed of porous stone materials. The study has the focus on salt weathering assessment on dolomite, a building stone that has been widely used in Anatolian monuments. The study is composed of laboratory analyses and non-destructive investigation techniques in order to better understand the causes and mechanism of decay. The artificially weathered dolomite samples by salt crystallization cycles were prepared at various states of deterioration, by exposing them to 5, 10, 15, 20, 25, 30, 35, 40 cycles of NaCl and Na_2SO_4 crystallization. Both fresh and artificially-weathered samples were examined in terms of their basic physical and physicomechanical properties, such as bulk density, effective porosity (total open porosity), ratio of fine pores, water absorption capacity, thermal dilatation coefficient, ultrasonic pulse velocity and modulus of elasticity. The thermal inertia characteristics of the samples were also determined by quantitative IR thermography (QIRT). The microstructural properties of the samples before and after the salt weathering cycles were investigated by means of stereomicroscope image analyses, XRD and SEM analyses. The state of deterioration or soundness of the samples were also defined by joint interpretation of ultrasonic and thermal inertia data. The results have shown that the change in durability characteristics in dolomite can be assessed accurately by monitoring their performance properties in terms of basic physical, physicomechanical and thermal properties. The data achieved is supported by microstructural properties of the fresh and artificially deteriorated samples. Deterioration of dolomite depending on salt crystallization cycles generally arises at the stone's weak parts like impurities, veins and cracks within the stone. The XRD analyses of the impurities formed in the cracks as well as SEM analyses verified the presence of calcite veins, iron oxide and clay minerals in the cracks. Ultrasonic and thermal inertia values of fresh and deteriorated samples established the reference/control data that can be used for in-situ examinations.

* Corresponding author: F. Erol erolfatos@gmail.com

CHARACTERIZATION OF THE LUSTRE TILES FROM THE FRONTEIRA PALACE (LISBON, PORTUGAL)

Teixeira, S.[1]; Lima, A.M. [1,2]; Alves, L.C.[3]; Silva, R.C.[4]; Vilarigues, M.[1,2]; Macedo, M.F. [1,2]; Coutinho, M.L.[2*]

[1] Departamento de Conservação e Restauro, Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa, Caparica, Portugal, [2] Research Unit VICARTE: Vidro e Cerâmica para as Artes, Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa, Caparica, Portugal, [3] C2TN, Campus Tecnológico e Nuclear, Instituto Superior Técnico, Sacavém, Portugal, [4] IPFN, Campus Tecnológico e Nuclear, Instituto Superior Técnico, Sacavém, Portugal

The Fronteira Palace located in Lisbon was built around 1670. Nowadays it still holds a unique collection of 17th and 18th century decorative tiles which were profusely used both in the interior of the palace and on its magnificent formal gardens. In the garden, a unique cladding of high relief lustre tiles combined with blue-and-white tiles adorn the Gallery of the Kings (Figure 1). The lustre tiles have been attributed to Manise production (Spain) while the blue-and-white tiles are thought to have a Portuguese origin (Meco 1997). Although many studies have been performed to characterize lusterware objects, fewer have been made to characterize tiles with lustre decoration. Therefore, in this work we analysed these tiles from the Fronteira Palace aiming at understanding both the technological production of the lustre layer and compare with the Spanish lustre production of the same period.

The red lustre tiles from the Fronteira Palace were characterized by Particle Induced X-ray Emission (PIXE) and Rutherford Backscattering Spectrometry (RBS) for elemental composition and in-depth profiling. The tiles stratigraphy was observed by optical microscopy, showing that these tiles are glazed with a colourless glaze coated by the red lustre layer. The analyses showed that the colourless glaze has a lead-alkali silicate composition and a copper-rich lustre overlay. These results are in agreement with the Manise lustreware production (Spain) after the XVII century, which was characterized by a new copper-like aspect of the lustre and a reduction or absence of tin opacification in the glaze (Polvorinos et al 2011).

Figure 1. Gallery of the kings in the gardens of the Fronteira Palace (A), niche of King Fernando of Portugal (B) and detail of a Lustre tile (C)

Meco, J.1997. A azulejaria. Revista Monumentos 7, 55-59.
Polvorinos, A.; Aucouturier, M.; Bouquillon, A.; Castaing, J.; Camps, J. 2011. The evolution of lustre ceramics from manises (valencia, spain) between the 14th and 18th centuries. Archaeometry 53, 490–509.

* Corresponding author: M.L. Coutinho mathildal@gmail.com, mal14681@campus.fct.unl.pt

CONDITION ASSESSMENT OF MEDIEVAL MURAL PAINTING BY USING PHOTOGRAPHIC TECHNIQUES AND LABORATORY ANALYSES: EXAMPLE FROM HUNGARY

Török, Á.[1*]; Galambos, É.[2]

[1] Department of Engineering Geology and Geotechnics, Budapest University of Technology and Economics, Budapest, Hungary, [2] Restoration Department, Hungarian University of Fine Arts, Budapest, Hungary

A few medieval churches enclose mural paintings in the Carpathian Basin. Many of these paintings are now in poor conditions and show various forms of damages. The current paper provides an overview of engineering geological tools that can be used in condition assessment of mural paintings. It presents an example of an 11th century medieval chapel that hosts one of the oldest and best preserved wall paintings in Hungary. The chapel is located in South Hungary and was constructed from porous limestone and sandstone. The wall paintings are from the late 12th century.

During the condition assessment survey both on site and laboratory techniques were used. Photographic documentation of normal light, UV luminescence and IR thermography were applied to help outlining moist zones and also salts. It also allowed the localization and visualization of damaged zoned. Moisture content was recorded with portable moisture meter to identify wet zones within the chapel and at the external parts of the monument. The foundation of the chapel was excavated and the underlying sedimentary formations and draining system were documented. Non-destructive surface strength tests (Schmidt hammer and Duroskop) were applied to compare the intact and scaling plasters and stone. Weak and uplifted zones were outlined based on Duroskop rebound values. Mineralogical and chemical composition of small samples of stone, plaster and pigments were measured by plane polarized light optical microscopy, SEM-EDX, XRD and thermogravimetry (DTA-DTG).

According to our analyses the interior walls are wet and the moisture is driven from the ground by capillary rise, especially in the plasters. The external stone walls are less wet. Major damages of wall paintings such as scaling, chipping and flaking are caused by salts. In the small samples taken from the interior part, from the wall and from the apse several soluble salts such as halite, sodium-nitrate and gypsum were identified. The stone ashlars and mortar of the external wall contained gypsum and halite. The plaster is a Byzantine-type with a calcium-carbonate rich substrate layer and fibrous organic compound containing upper layer. The colours of the wall painting are dominated by earth pigments: iron-oxide containing red and yellow (ochre) and green earth. This is the first and so far the oldest example in Hungary, where ultramarine blue pigment was identified in this chapel. Engineering geological tools helped in the identification major causes of damage, while laboratory analyses of salts and pigments allowed the identification of gypsum and highly hygroscopic salts and also traces of biological activity all responsible for scaling and chipping of wall paintings.

* Corresponding author: Á. Török torokakos@mail.bme.hu

CONSERVATION OF METAL OBJECTS: THE PERSPECTIVE OF CENTRAL AND REGIONAL LABORATORY FOR RESTORATION AND CONSERVATION IN ISTANBUL (TURKEY)

Tulgar Yılmaz, S.*

Central and Regional Laboratory for Restoration and Conservation, Istanbul,Turkey

The Central and Regional Laboratory for Restoration and Conservation was founded under Republic of Turkey, Ministry of Culture and Tourism in 1985. The primary responsibility of the laboratory is to preserve and study works of art and architectural heritage in Turkey.

In 2012, the laboratory is moved from an old building to a newly designed facility integrating studios and laboratories. Today, totally more than 50 conservators, chemists, geologists, engineers and archaeologists are working in the laboratory with the aim of supporting conservation studies with scientific approach.

The Central and Regional Laboratory for Restoration and Conservation is also fully equipped for conservation of metal artefacts. The metal conservation section is responsible for the care and treatment of all three-dimensional metal artefacts in Turkish Museums. The objects, representing most of the Anatolian major cultures, range from ancient Mesopotamian artifacts to contemporary twenty centuries monumental outdoor sculpture.

In this paper is to present a view of metal conservation in the Central Laboratory for Restoration and Conservation in Istanbul. Such as diagnosis studies of metal objects, analysis of corrosion products, selection criteria of their treatment methods and brief description of the atmospheric plasma technique which is planning to newly design for the conservation treatment of metal objects in the laboratory.

* Corresponding author: S. Tulgar Yilmaz sedatulgar@gmail.com

CONSERVATION OF XX CENTURY ARCHITECTURE IN THE CENTRAL CAMPUS OF THE UNIVERSITY CITY OF MEXICO

Valencia Navarro, J.*

Academic, Masters Degree Program on Conservation of Monuments and Sites. Coordinación de Estudios de Posgrado, Facultad de Arquitectura. Universidad Nacional Autónoma de México, Mexico City, Mexico

The Central Campus of the National Autonomous University of Mexico, built between 1948 and 1952, included in the UNESCO World Heritage, has unique architectural, artistic and landscape elements.

Some of the artistic and architectural features were built using local materials in conjunction with concrete and steel structures. Nowadays after more than 60 years, some of the most relevant artistic and architectural outdoor elements are suffering from decay due to the interaction with weather and its effects that have been accelerated by climatic changes, affecting specific constitutive materials. It has been necessary to examine and understand the constructive techniques used at that time, obtaining new data to determine specific conservation specifications to preserve the original architectural character of the Campus, that in some cases was altered due to a maintenance policy approach versus a conservation policy approach in order to preserve the original characteristics of the University City.

Sharing some of the experiences obtained from specific conservation processes carried out on the onyx facades and the surveying and diagnosis techniques using unmanned aerial vehicles, can be of interest for those involved in the conservation and preservation of the XX century built heritage.

* Corresponding author: J. Valencia Navarro jvalencianavarro@yahoo.com.mx

EXPERIMENTAL DEVELOPMENT OF DETERIORATION IN ABS PLASTIC

Valle Herrero, I.*

Heritage Conservation and Restoration School, Valladolid, Spain

It's interesting how the new materials and the industrial ones are making their way to the artistic manifestations. That's why, in the studies of heritage Conservation and Restoration, inside the Contemporary Art subject we developed a project about the analysis of new art manifestations excluding the traditional materials.

This particular case illustrates the ABS (Acrylonitrile butadiene styrene), industrial material applied to the art field. Thermoplastic commonly used by the industry to make pipe systems, musical instruments, automotive trim components, enclosures for electrical and electronic assemblies, and toys, including the bricks made by the famous company Lego.

That bricks, or PCB (Plastic Construction Bricks), are increasingly used by artist to make sculptures. That is the case of Nathan Sawaya, Jan Vormann, Tary, Ai Weiwei, Chris McVeigh, Mike Doyle, or Andy Hung Chi Kin, among others.

In this work was evaluate how the material reacts to a series of factors to which the actual artworks can become exposed in its real environment (specially the ones made by Jan Vormann, exposed in the street), such a high humidity, an acidic medium in several proportions, biological remains, the physical action of scratched, the fire (directly and indirectly) and the chemicals of an ordinary spray paint, simulating the effect of a graffiti.

All those effects were proven over some constructions made of PCB from several colors, to estimate the damage in every piece and to find a restoration solution to them. To evaluate those damages were measured the next features, by comparison to not damaged pieces: texture, color, shine, mechanical strength (fragility) and deformations.

The results in some cases, like the parts exposed to an acidic medium, were very graphic. All this results were compared to prove which are the most harmful factors to this material, and which ones are capital to avoid in the artworks conservation.

Finally, it was raised a hypothetical restoration for each case of deterioration trying to bring back the properties why this material was selected by the artist, such as the brightness or the color. Including experiments with solvents to produce a material reintegration.

The main conclusion to this experiment is that new materials present also new problems for the restoration process, and the way we resolve them is not transferable from the traditional techniques.

*Corresponding author: I. Valle i.valle.herrero@gmail.com

MULTI-METHOD ANALYSIS OF THE 18TH CENTURY PORTRAIT OF COUNT ANDRAS HADIK DE FUTAK

Van der Bergh, J.M.[1*]; Miljević, B. [1]; Brdarić, O. [2]; Petrović, V. [2]; Vučetić S. [1]; Ranogajec, J. [1]

[1] University of Novi Sad – Faculty of Technology, Novi Sad, Serbia,
[2] Provincial Institute for Protection of Cultural Monuments, Petrovaradin, Serbia

A multi-method approach was developed for the characterization of the binding media and pigments present in the painting layers of the count Andras Hadik de Futak portrait from the 18th century (work by an anonymous author from 1764). The used analytical protocol involved non-destructive techniques: X-Ray Fluorescence Spectroscopy (XRF) and Fourier Transformation Infra-Red Spectroscopy (FTIR) as *in situ* methods before and after the cleaning procedure. In addition, X-Ray Radiography (RTG) and multispectral analysis of the painting, as well as Electron Scanning Microscopy with Energy Dispersive Spectroscopy (SEM-EDS) analysis of the selected cross-sections of the painting samples before the cleaning procedure were also done.

Count Hadik, a Hungarian nobleman of Slovak origins, a personal friend of Empress Maria Theresa, was a prominent figure in the Habsburg Empire as a famous Hussar-cavalry General and a Field Marshal during the Seven Years War. The painting has been discovered in the village of Futog in northern Serbia. It was there that Count Hadik died in 1790, at the time when the place was called Futak and belonged to the Kingdom of Hungary (Habsburg Empire).

The investigation of the painting was done in two stages – before and after the cleaning procedure. The aim of the first part of the investigative work was to determine the painting techniques in order for the decisions to be made concerning the future conservation treatments and for the painting's historical authenticity to be confirmed. During the cleaning work another painting beneath the investigated one was discovered. This newly discovered painting was presumed to be the original portrait of Count Hadik. The second stage encompassed investigative work on the newly discovered portrait.

In the initial investigation stage it was determined that all the samples were multilayered i.e. the existence of the original portrait (inner layer) underneath the visible one (outer layer) was confirmed during and after the cleaning. Based on the results of the aforementioned methods, differences between the original (inner) and the initially visible (outer) painting layers were discovered. Latter-day interventions were discovered only on the visible (outer) painting by identifying the pigments which came to use centuries after the portrait had been painted originally, e.g. zinc white (1845) and titanium white (1921). The ground layer of the original (inner) painting was identified as red bole, while the ground layer of the subsequently executed (outer) painting was based on lead white. The RTG scanning showed significant damage of the painting not visible to the naked eye, as well as inserted pieces of canvas (part of latter-day interventions). These findings greatly facilitated conservation efforts i.e. the determination of the correct conservation strategy and the presentation of the portrait.

* Corresponding author: J. M.van der Bergh, milanbergh@tf.uns.ac.rs

CHARACTERIZATION OF PATINAS FROM THE MAIN FAÇADE OF "PALACIO DEL INFANTADO" (GUADALAJARA, SPAIN)

Vazquez-Calvo, C.*; Alvarez de Buergo, M.; Fort, R.

Geosciences Institute IGEO (CSIC-UCM), Madrid, Spain

Patinas have been deeply studied during the last years. However, every new case has its own importance as it happens with the study of mortars or other building materials.

In this case the scarce remains of the orange patina that covered some parts of the main façade of the "Palacio del Infantado" (Guadalajara, Spain) -figure 1- have been studied. The main aim, apart from knowing the characteristics of the patina, was to determine whether it would be necessary to preserve it in further interventions.

For this purpose fragments – scales- smaller than 1 cm^2 were sampled. Color properties were determined by means of an spectrophotometer; and patina samples were characterized by different microscopy techniques such as Optical Microscopy (OM), Fluorescence Microscopy (FM) and Scanning Electron Microscopy with coupled Energy Dispersive X-Ray Spectroscope (SEM-EDS).

Thank to these techniques up to three layers have been distinguished in the patina. Besides, the mineralogical analysis revealed that the main composition of the studied patinas was calcium oxalate (whewellite) hydroxyapatite, calcite and gypsum.

These results together with other obtained in the study point out that these patinas are similar to those described in the literature as calcium oxalate and calcium oxalate patinas. As a consequence this patina should be preserved in future interventions since it is recommended in several international charts.

Figure 1. Main façade of the "Palacio del Infantado" (Guadalajara, Spain)

Research funded by Geomaterials 2 (S2013/MIT_2914) Programme.

* Corresponding author: C. Vazquez-Calvo carmenvazquez@geo.ucm.es

INFLUENCE OF INORGANIC AND ORGANIC ADDITIVES ON THE COLOUR OF LIME MORTARS

Velázquez Pérez, J.A.[1 *]; Alonso Guzmán, E.M. [1]; Martínez Molina, W.[1]; Chávez García, H.L.[1]; Lara Gómez, C.[1]; Arreola Sánchez, M.[1]; Ruiz Ruiz, R.[1]; Arguello Hernández, S.C.[1]; Torres Acosta, A.A.[2]

[1] Faculty of Civil Engineering, Universidad Michoacana de San Nicolás de Hidalgo, [2]Instituto Mexicano del Transporte de la Secretaría de Comunicaciones y Transportes, Sanfandila, Querétaro, México

Today it is proposed that the heritage monuments are operated using the same techniques that were built and the use of materials or new techniques according to Martinez et al (1993) is not approved. In Mexico there have been several studies characterizing various additives, mechanical and physically, both organic and inorganic, with which prehistoric and colonial monuments were built, according to Velazquez (2015) and Martinez et al (1993), requiring determine the color variations that each type of additive gives the mixture.

Another use may have these materials is to restore the original colors of a monument or parts of it. The materials of chromatic reintegration have been varied for some decades. Nowadays more innovative materials comprising features as greater workability when being used and serve an aesthetic function are in use, integrated into the set of the original work and improving their reading, according to Lastras et al (2011 and 2012) and Martinez-Ramirez et al (2008).

In this paper the changes of color lime mortar base mixtures with additions of materials such as clay, ash brick, quarry dust and cornstarch were analyzed; comparing these additions with a control mortar of lime-sand. To quantify the color colorimetric coordinates were measured, expressed in terms of the coordinates C.I.E. (L *, a * and b *). These studies determine the mean chromaticity coordinates, which are in the range of red-yellow as is orange. In designing a mortar with the original color they would have to take into account the measured values of L * a * b *.

Martínez, W.; Morales, E.; Alonso, E.M.; Bedolla, J.A., CICOP 2010. Act X International Congress cicop 2010 - rehabilitation of architectural heritage and building "The additions of Opuntia cactus white and its effect on masonry mortars made with lime"
Velazquez, J.A., December 2015. Thesis professional. Universidad Michoacana de San Nicolás de Hidalgo, Faculty of Civil Engineering. Morelia, Michoacán, México "Experimental archeology in lime herigate base for use mortars" .Lastras, M.; Martínez, M. L.; Martínez, E.; Simón, J.M., Núms. 6 y 7 - 2011 y 2012. Arché. Publication of the university institute heritage restoration of the UPV. "Study painterly members applied in the restoration of tiles exposed to the outside"
Martínez, S.; Sánchez de rojas, M.I.; Azorín, V.; Blanco, M.T., 2008. Act of the Second Conference on Research in Construction. ISBN: 978-84-7292-367-6." Color and composition of original plaster Palace Farm" (Segovia).

* Corresponding author: J.A. Velázquez judithalejandra21@gmail.com

THE STAIR: AN ANTHROPOLOGICAL AND SYMBOLIC ELEMENT. A RESEARCH ON THE STAIRS IN THE LONG CHANG TEMPLE

Wang, W.*

Department of Advanced Architectural Projects, Technical University of Madrid (UPM), Madrid, Spain

The research is mainly based on the stairs of Long Chang Temple, which is one of the most important Buddhist temple Heritage in Southeast China. As a temple of more than 1400 years, with a total area of 7,240 ㎡ and the available area is 5,725 ㎡. Among them, the major of the existing buildings were built during the Ming dynasty (A.D. 1368-1644) and Qing Dynasty (A.D. 1636-1912). It is quite a special temple that the topographical variation and historical evolution result on the unique layout. Contrasted to the small entrance, it is quite a large temple constituted by seven blocks of temples. Among them, stairs play important roles in connecting different blocks of space, which actually perform the most interesting and important content of layout. Moreover, stairs are exactly the places where express the relationship between human perception and religious symbols, the mainly two points of analysis of this article.

Site investigation, observation, drawings and relevant articles analysis are important to understand the relationship between human perception and stairs. Through two weeks of experiencing in the temple, 62 stairs in Long Chang Temple have been surveyed and drew. Besides, the way of construction and performance of visitors walking through the stairs are recorded to further on interpreting how the variation of stairs affect the change of visitors' body gesture.

After series analyses, it is important to distinguish special stairs with religious symbols from the normal daily functional stairs, since it is significantly to analyze how the visitors' perception related with concrete preset scenes on the temple route.

For simple stairs, although they are actually formed by surfaces and lines: riser and tread, height, width and length, their unique variations play important roles in shaping religious symbolic route. The route of temple is essentially stair being enlarged, while each step of the stair is route being concretely defined. In this aspect, four key elements: route, light, water and time are used to further analyze how stairs transmit symbolic significance by way of human perception.

Through specific investigation and abstract analysis, the aim of the article is to focus on how Buddhist culture could be translated into concrete architectural language, perceived by human bodies, even more developed to influent architectural design in nowadays.

* Corresponding author: W. Wang wangweiqiao714@gmail.com

FOUR BUDDHIST MOUNTAINS IN CHINA: TEMPLES AND ITINERARIES

Wang, W.[1*]; Melero-Tur, S.[2]

[1] Department of Architectural Projects, Technical University of Madrid (UPM), Spain;
[2] Department of Construction and Technology in Architecture, Technical University of Madrid (UPM), Spain

This research focuses in the four main sacred Buddhist Mountains in China: Putuo, Jiuhua, Emei and Wutai. There is more than 2.000 km distance between them. The Buddhist architecture of the temples has been studied and documented previously by several authors inside and outside China (Nan Shunxun et al, 2007). Architect J. Prip-Møller (1889-1943) was pioneer researching on this type of architecture in the beginnings of the 20th Century.

The temple, sacred place and dwelling at the same time, inserted in a natural place, which is sacred before the existence of the temple. Sacred space is inside/outside the built space (temple), man walks, prays and meditates inside/outside. There is no building construction limits, hence, the site must be understood globally. Mountain, vegetation, paths, holes, materials, architectural limits are interrelated. Itineraries, paths are inside/outside, Nature structures and supports constructions and itineraries as a whole.

This research work provides an original view including nature-temple-human as a set, relating tectonic (man-made) with sacred natural space and with the daily human environment. Focusing on this set, inside/outside itineraries connect temples, nature and are main part of the daily life in the site. By means of a self-developed methodology, we carry out data collection, observation and analysis of the four described sites, its itineraries and buildings (Figure 1). We put together and compare them and analyze the environmental influence on built temples and monks life for these four sites, searching for the compositional principles of the whole site.

Figure 1. Location of the four Buddhist Mountains in China and its temples

Shunxun, N.; Foit-Albert, B. China's Sacred Sites. Ed. Himalayan Institute Press. Honesdale, United States, 2007. ISBN: 978-0-893892623.

* Corresponding author: W. Weiqiao wangweiqiao714@gmail.com

ANALYSIS OF THE ORIGINAL, MATERIALIZATION AND MATURATION OF THE CORE PROTOTYPE EN CHINESE TRADITIONAL GARDEN

Xie, Y.*

Department of Composition, Technical University of Madrid (UPM), Spain

Chinese and European painting history have experienced a time from when those artists were just focus on the human figures to taking natural into aesthetic categories. However, due to the special philosophy of the Chinese people as well as a number of other reasons, the painting of landscape appeared about 1500 years ago in China. On the other hand, in Europe, similar type of painting did not appear until the Renaissance. In the Song Dynasty (A.D. 960–1279), Chinese literati class's special affection for the Nature developed the observation of it. These affection and visual experience makes Chinese garden reached its peak period in the Ming Dynasty (A.D. 1368–1644). Another thing need to be emphasis is: in China, painting of landscape is called *Shan-Shui* (mountains and water) painting, which in fact implies clearly the subjectivity of the natural in Chinese landscape painting.

The prototype of *Hai-Shang-San-Shan* (three mountains on the sea) in Chinese Culture appeared in the Qin Dynasty (B.C. 221 – 207). It was the ideal wonderland in Chinese culture. This prototype is not the "paradise" in Western culture, because of the distinct "worldliness", which means it is not the other side, but a symbol of a special land in earthly life. This indicated that the core of the Chinese garden's prototype is a space full of feelings, but not a construction that only used abstract rational as a guiding principle .The yearning of the ideal wonderland and the appreciation of the nature was the main reason for the garden construction in continuous developing in Chinese history. Those royal gardens in early time were so large and the scale is close to the real natural. This can be the feature of the first stage of garden construction. In the second period, miniature natural landscape began to appear the gardens. In the third period, imitating of the natural fragment gradually win the favor of the literati class.

In the long history of garden construction, it was always related closely with the landscape painting. But until the late Ming Dynasty , it began to appear that gardening activities learn directly from the experience of painters. Those garden designers imitate the fragment of the nature, creating the real experience of the naturel space in small scale. In this section we will take *Yi-Pu* in case to analyze the typical garden of the Ming Dynasty.

Finally, with the help of the comparison of the transformation of ideological in gardening art with the Chinese tradition, we will understand it better in a broader context.

* Corresponding author: Y. Xie yiqixie2016@gmail.com

CONSERVATION AND MANAGEMENT RESEARCH ABOUT PRIVATE PROPERTY HOUSING IN SHANGHAI LILONG HISTORICAL RESIDENTIAL DISTRICTS. A CASE STUDY ABOUT YUHUA NEW VILLAGE

Zhu, Y.; Yong, S.*

College of Architecture and Urban Planning, Tongji University, Shanghai, China

In the research field about Shanghai Lilong historical residential districts, there are almost little discussions about the conservation and management of private property housing, because public property housing occupies much greater percentage than private ones in these districts. Although there has been difference in property right, private and public property housing have no differences in heritage value as City Protected Historical Site and Excellent Historical Buildings, and as well as being both an indispensable part in community development. For private property housing occupies a large percentage in Yuhua New Village, this article chooses Yuhua as a typical case study. Through analysis of several key aspects about the current situation and existing problems in conservation and management of private property housing, the article then offers related policy proposals.

In the aspect of residential population and housing property right evolution, since built up in 1940s, Yuhua New Village has a relatively stable process. Only in 1960-1970s, because of the national housing distribution policy in special time, large numbers of new residents were distributed into Yuhua and many other similar Lilong districts. After that time, property right of most houses were returned to the original residents and today's circumstance has generally formed, which means private and public property housing both exist in Yuhua, and private ones are at majority.

In the aspect of current use of private property housing, they have overall acceptable residential density, so that the adjustment problem caused by high residential density is not obvious. However, because of its private property right character, these houses have not been renovated in the late forty years and lack appropriate maintenance. Nowadays, there are two main usages of private property houses, which include residential and commercial function. And the situation above brings two main problems. First one is that inappropriate house rental behavior brings negative influence on the conservation and management of historical buildings. Second one is the responsibility of conservation and renovation of private property housing. After that, article discuss the second issue from private and public property housing residents, as well as property management company.

Based on the investigation of private property housing residents' spontaneous renovation will and spontaneous renovation status, the article proposes several policy suggestions targeting on the problems above. A residents' spontaneous renovation mechanism of three-party cooperation is advised to set up, which means "private property housing residents pay the renovation expense-government subsidizes the conservation process -property management company offers renovation service". Besides, other proposals include opening the market resource of conservation and renovation service for historical house building, and making some standards about house rental behavior. And in this process, community residents can fully use their autonomy.

* Corresponding author: Yong, Shao nyshao163@163.com

STONE ALTERATION ON THE FACADE OF A BUILDING IN OVIEDO

Zuvillaga del Busto, F.[1*]; Alonso Rodríguez, F.J.[2]

[1] Zuvillaga Arquitectura, Oviedo, [2] Dpto. Geología, Univ. Oviedo, Spain

A building in the center of Oviedo, in Suárez de la Riva Street, with a facade clad in natural stone tiles, is in a poor conservation state that is generating moisture inside the apartments. Under these circumstances, the Community of Owners hires an architect to assess whether to rehabilitate the damaged stones or to replace the existing skin by a new one, what finally is going to be done, in the next five months, as it is not a listed building.

A decision must be made considering the convenience of the rehabilitation of the stone as a constructive element within the architectural composition, the functionality of the element in itself and the response of the material in terms of durability and aging over time.

The aim of this work is to know what factors affect this difference in behavior, taking into account the importance of stone properties and the influence of the location and height of elements.

The rock is a finely granular calcareous sandstone of medium gray color, with micropores. It has a relatively varied mineral composition of quartz, dolomite, calcite, muscovite and clay. The areas of decay show different types of damage, the most frequent ones being discoloration related to blackening or soluble salt deposits, and loss of material such as disintegration and peeling.

For its assessment, the current state of the facade is defined reflecting the damages that allow the overall understanding of the conservation state (Figure 1). Various types of actions keeping in mind the degree of intervention and its consequences will be proposed: (I) a repair consisting of the replacement of the damaged stone by another one with similar characteristics; (II) a partial rehabilitation, replacing damaged stones and applying an intervention on a larger surface considering the color differences between the restored and the original stone; and (III) a complete rehabilitation of the facade, removing the existing stone and installing a ventilated facade.

Figure 1. The stone, installed twenty-five years ago, has damages at different stages of evolution, showing in some areas a high degree of alteration while in others it remains in good condition

*Corresponding author: F. Zuvillaga zuvillaga@yahoo.es